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CHURCH OF ST. PETER'S, BOURNEMOUTH, ENGLAND.

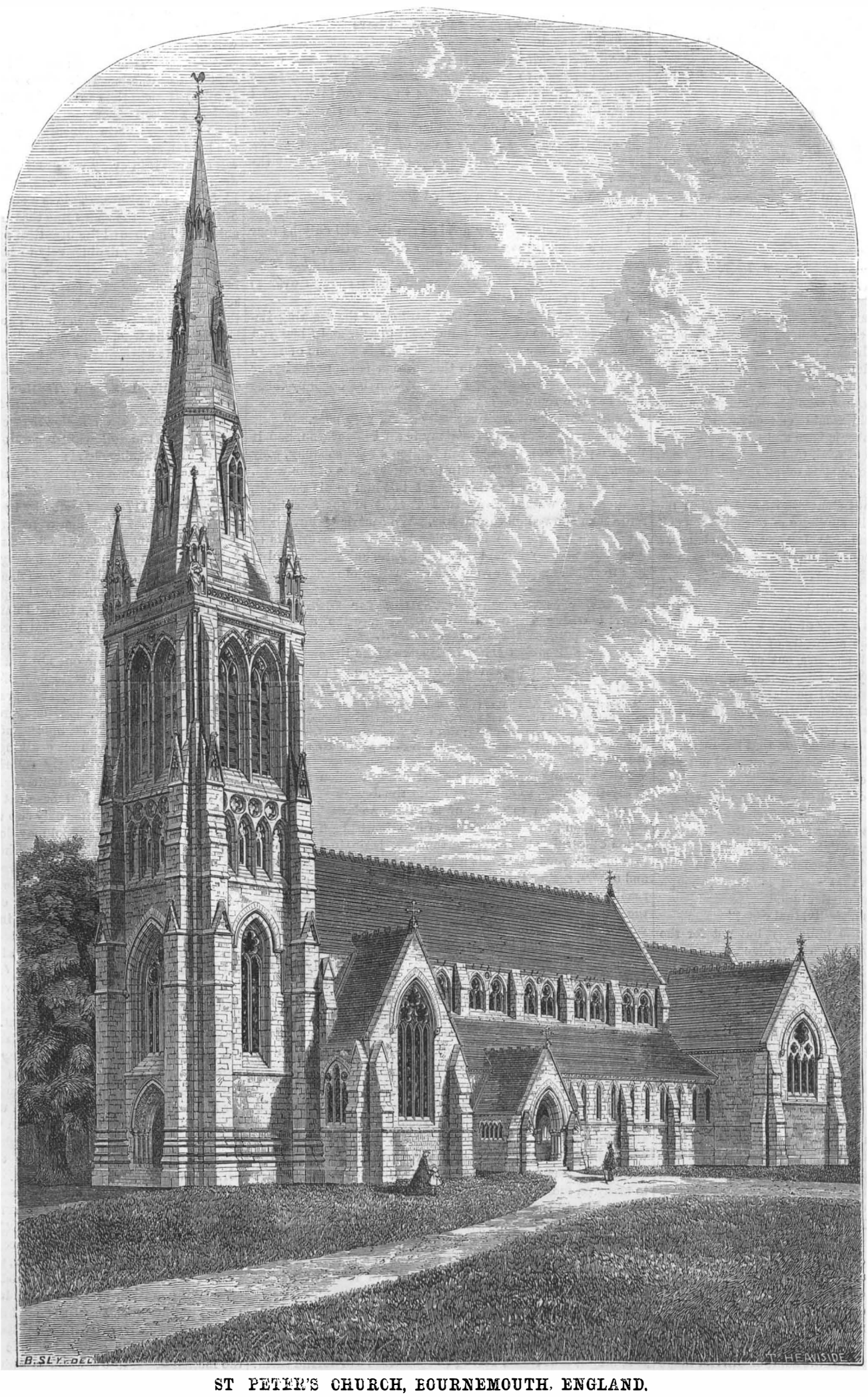
The general design of this church, as shown in our engraving, while it may compare favorably with church architecture generally, is remarkable for the fact that it was not designed at once, but at different periods, one part being, so to speak, patched on to another, until the building has attained its present proportions. The successful accomplishment of this difficult task furnishes a useful study for young architects.

First of all, a south aisle was added to a poor modern chapel of ease, then a north aisle, then a clerestory, so that the old chapel gradually disappeared. After this, in the year 1863, a very costly chancel with aisles was built. This is groined in stone, and has a sumptuous painted and sculptured reredos, the walls on each side of it being lined with charmingly designed groups of angels painted on tile. On each side of the eastern bay of the chancel are double screens of marble and alabaster, which form two ranges of sedilia. The two aisles on each side of the choir seats are occupied by lofty metal screens. In the wall on the north side of the chancel is a sculpture of the Crucifixion, while opposite to it is a sculpture of the Annunciation, and over the vestry door another, of the Charge to St. Peter. The vestry, on the east side of the north transept, is three stories in hight, with a newel staircase. Below is the heating chamber, on the church level the clergy vestry, and above this the choir vestry. Almost all the windows throughout this part of the church are of stained glass.

Latterly it has been found that the church was not large enough, and an addition of a somewhat novel kind is now proposed by the architect; namely, a western transept, beyond which is a steeple. The steeple is already built up to the top of the tower, and the western transept will, it is expected, soon be built, so as to connect the steeple with the church. The tower is 25x25 feet, and 103 feet high to the top of the parapet. The hight of tower and spire will be 188 feet. The lower stage is groined in stone, and the belfry is being provided with a heavy peal of bells.

A large churchyard cross, with sculptures on the base, and a lych gate, of stone and oak, are also being erected in the beautiful churchyard.

The extreme length of the church, when completed, will be 180 feet. The whole of the work, with the exception of a portion of the south aisle wall, has been done from the designs of Mr. G. E. Street, A.R.A.



ST PETER'S CHURCH, BOURNEMOUTH, ENGLAND.

Steam Pressure Gages.

At the meeting of the Institution of Mechanical Engineers, held at Birmingham, on the 26th October, there was read a paper "On Steam Pressure Gages," by Mr. Ernest Spon, of London, communicated through Mr. Charles Cochrane. Of this paper we subjoin an abstract:—The reliable construction of steam pressure gages is of much importance in connection with the safe working of steam boilers, a great number of the spring pressure gages in ordinary use having been found inaccurate, either from defects in original construction or in consequence of their becoming unreliable when in constant use. In the Bourdon gage, which is the spring pressure gage that has been the most extensively used for a great number of years, the indication of the pressure is obtained by the employment of an elastic metallic tube, bent to a curved form, which, when subjected to internal pressure, becomes less curved; and the resulting movement of the free end of the tube communicates motion to an index upon a dial, through the intervention of a lever or a toothed sector and pinion. The elastic tube, however, is liable to become permanently strained by continued use, or by accidental exposure to an excess of pressure; and the indications of the gage are then no longer correct.

In the Schaeffer gage, the pressure is measured by the deflection of a circular corrugated steel plate, fixed round the circumference and bulged in the center by the pressure, the extent of the bulging being magnified upon a dial by means of a toothed sector and pinion. This gage, though it has been considered one of the best in use, has a disadvantage in the very small range of deflection of the plate under the pressure, requiring the motion to be very largely magnified upon the dial, whereby any errors are also proportionately magnified. The plate is also liable to be permanently strained by an excess of pressure, and is, moreover, liable to crack when continually worked. The metal of this plate being very thin, as is also the case with the elastic tube of the previous gage, its elasticity is liable to be diminished when any oxidation takes place, and error in the indications is then the consequence. The pressure is also measured by the bulging of a circular steel plate in Wallis' gage, but the deflection is increased by the plate being cut into five segments by radial slits; and a thin brass diaphragm, or a sheet of vulcanized india rubber, is used to cover the slits on the side exposed to the pressure. The brass diaphragm, however, is found too rigid to admit of the requisite sensitiveness in the gage; while the india rubber is liable to get forced into the slits by the pressure, thereby obstructing the action of the gage. A solid piston, working in a cylinder, is supported against the steam pressure by a steel

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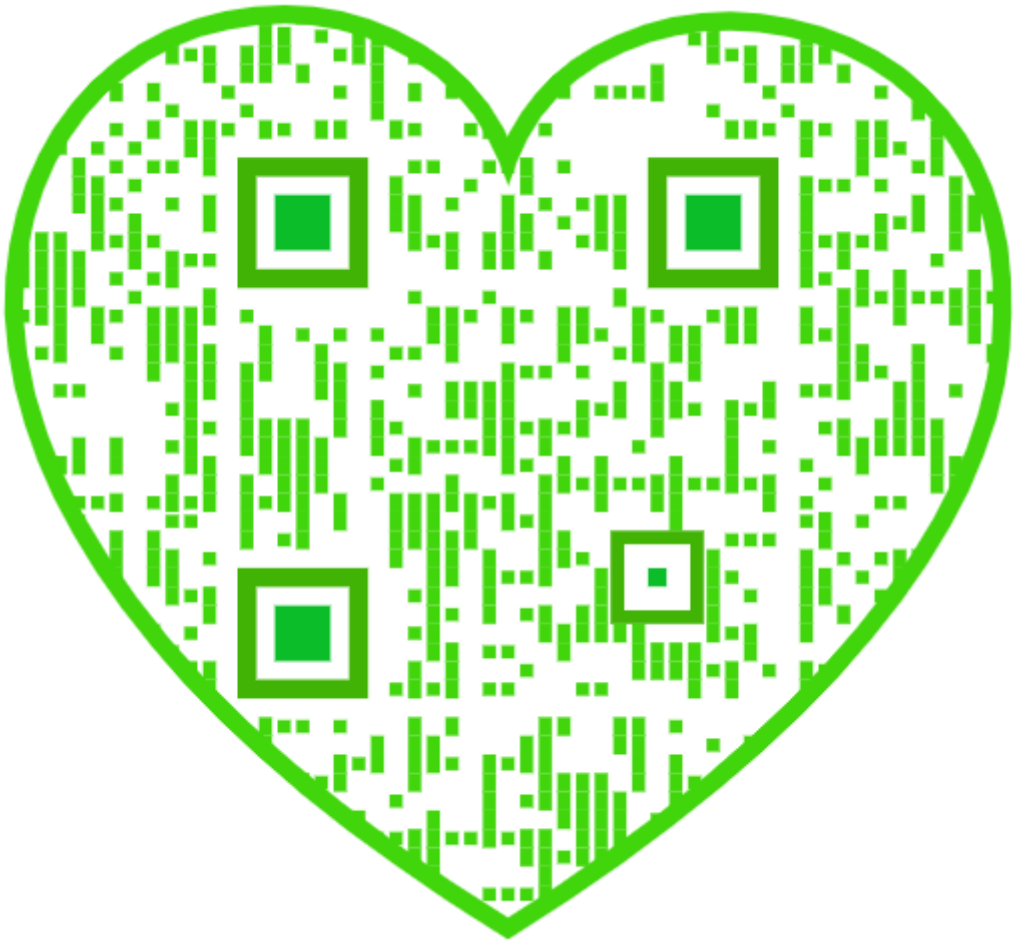

spring in Miller's gage, and is rendered steam tight in the cylinder by an india rubber diaphragm, which is fixed round the circumference between the flanges of the cylinder; the motion of the piston is communicated to the index by means of a short chain, coiled round the spindle of the index, and attached to the arms of a vibrating bow, which is actuated by the piston rod. The motion of the piston is limited to a very short range, owing to the risk of the india rubber diaphragm getting cut round the edge of the piston with a longer action; and the construction of the multiplying gear for the index involves objectionable complication. In Smith's gage, which has been extensively used, a steel volute spring is employed, and is acted upon direct by the steam on one side, being covered on that side by an india rubber diaphragm secured round the circumference to make a steam tight joint. This spring has a considerable range of action compared with the gages previously noticed, and being of considerable substance is not liable to be affected in strength by corrosion; the deflection of the spring moves the index by means of a rack and pinion. Three concentric spiral springs, placed one within another, with their ends covered by an india rubber diaphragm, are employed in Silvester's gage, which is similar in principle to the last one; and the motion is communicated to the index by a rack and pinion. There is, however, an objection to the employment of a rack and pinion, for actuating the index of a pressure gage, on account of the play occurring in toothed gearing; and in Foster's gage, in which the pressure is measured by the deflection of a volute spring covered by an india rubber diaphragm as before, the movement of the spring is transferred direct to the index, by means of a stud fixed to the center of the spring and working in a spiral groove in the spindle of the index. This pressure gage has been found by the writer to be superior to the other gages in use, in regard to durability, accuracy, and sensitiveness. The strength of spring employed is proportionate to the limit of pressure to be measured, the total range of deflection being the same in each case. Specimens were exhibited of the various gages described, and the action of some of them was shown by means of a force pump.

CORNELL UNIVERSITY.---A STUDENT'S LABOR FOR KNOWLEDGE.

A correspondent of the New York *Times*, recently visiting the Cornell University, describes, among other interesting particulars, a conversation held with one of the students. The interview gives a good indication of the qualities of the young man, who is a sample of a great many, in the Cornell and other institutions of learning, who are obtaining an education under what the world would call adverse circumstances. But although the labor is hard and the deprivations great, they form the furnace of trial, to refine the intellect, and produce a mental and moral state of sterling purity and value.

"I looked around for some student who could inform me as to the progress made in the specialty of Cornell—the self supporting part of the system. At last, by good chance, I came upon a room where a young fellow of twenty-three was studying Sanscrit. Having been in India for many years, I was interested in his studies, and we commenced an animated conversation upon philologic roots. We criticised Max Müller, commented on Bunsen's theory of the Pelasgic people, and heartily agreed upon the absurdity of studying Greek and Latin, which were dried sponges, out of which everything good had been taken by our ancestors. Incidentally I learned that this most accomplished gentleman was supporting himself by laboring on the farm. He generally worked three hours a day, and six hours on Saturdays, and had already got through his appointed labor for that Saturday. I asked him if the manual labor of plowing, etc., did not stupefy him, contract the brain cells, and make his apprehension duller. He replied that it did not, because he had been brought up as a farmer, and had nothing to learn when he came to the college. He was taking the agricultural course, but had become interested in philology, and one of the professors, who knew Sanscrit, had become interested in him, and had given him lessons in that perfect language, though Oriental studies are not in the curriculum.

I said: "I suppose yours is an individual case?"

STUDENT—Yes, as regards the philology, but not for the farm. There are twenty-nine of us who work on it.

CORRESPONDENT—Does it pay your expenses?

STUDENT—It pays mine; but then I worked steadily during the long three months' vacation, which ended in September. I can go easy now if I feel inclined.

CORRESPONDENT—I suppose the hardest part of the work is done by laborers employed for that purpose?

STUDENT—Not at all. There are only two teamsters hired on the farm, and all the other work is done by us. At this moment we're laying down a series of drains, and this is very heavy work indeed.

CORRESPONDENT—Did you do that this morning?

STUDENT—Yes, for six hours.

CORRESPONDENT—And did you not feel stupefied or tired out?

STUDENT—Not at all. I dislike the work, and was very glad to get back to this, but I was not tired.

CORRESPONDENT—Are there any other methods of earning one's support here, besides the farm?

STUDENT—Oh yes. If you can print, you can earn more in the press room than on the farm, and soon there will be lots of work in the machine shop. The men are going to make copies of Ollivier's geometric models.

CORRESPONDENT—What's that?

STUDENT—Why, a Frenchman of the name of Ollivier made a set of models to illustrate all the problems of geometry. A set was purchased by the State of New York, and is, I think, at Albany. They are going to make copies of these. Twenty thousand dollars were given, I believe, for the first set that he made, but our fellows here can make them for eight hundred.

CORRESPONDENT—I see. Well, but men who can't handle tools will not be able to do that sort of thing.

STUDENT—Certainly not. Skilled labor is at the same premium here that it is elsewhere.

CORRESPONDENT—What can the men do who have only their manual strength?

STUDENT—Well, they can work on the farm or they can grade the square.

CORRESPONDENT—They can do that, but then do they?

STUDENT—As a general thing they attempt it, and finding it rather rough, give it up in despair, and go home.

CORRESPONDENT—Well, but that was hardly what Mr. Cornell designed, was it?

STUDENT—No; he expected that the college would give work to every one, that cared to take it, of a kind that he could do. I suppose that this will be done in the future by outsiders, but it can never be accomplished by the college.

CORRESPONDENT—Something in the factory way, you mean. I suppose something that will utilize the grand water power that is running to waste so picturesquely in the gorges.

STUDENT—(laughing)—I guess so. I have heard that Mr. Cornell has some such scheme in his head.

CORRESPONDENT—But even then, perhaps, the men could not earn enough to keep them. Let us calculate a little. I have been through some factories in Auburn lately, and I learned the rate of wages current there. Such work as unskilled students could do would be paid at the rate of seven, say eight, dollars a week for a day of twelve hours. Now, how many hours can you average of work throughout the year?

STUDENT—About half a day if I work steadily through the vacations.

CORRESPONDENT—Very good; then that will only be four dollars a week throughout the year for everything.

STUDENT—That would be quite sufficient. My expenses are only three dollars a week, and I earn enough over to keep me in coarse clothes.

CORRESPONDENT—I beg your pardon for the seeming impertinence of the question I am about to ask, and I beg you to believe that the spirit that dictates it is not one of mere curiosity. Are you living in this fashion from necessity, or do you perhaps wish to show that it can be done by those who have no resources?

STUDENT—I do it from necessity; I am very poor.

CORRESPONDENT—Sir, from my heart I honor you, and if the sympathy of a stranger can lighten a road so stony, pray understand that you have it in the fullest sense of the word.

We shook hands heartily, and I left him to his Sanscrit, feeling as I walked away that Cornell meant something more than showed on the surface. We Americans have been rather apt to worship the dollar, but when poverty is so honorable and so honored as it is here, our golden idol is like to tumble a peg or so in the estimation of society."

The Unity of the Race---Waiting for Light---The World Older than Chronology---Science and Religion Reconciled.

From the Brooklyn *Daily Union*, we make the ensuing extracts of a sermon preached to his people, on Sunday, Nov. 18th, by Henry Ward Beecher, from the following text:

"Acts xvii. 26, 27—"And hath made of one blood all nations of men to dwell on all the face of the earth, and hath determined the times before appointed and the bounds of their habitation; that they should seek the Lord, if haply they might feel after Him, and find Him, though He be not far from every one of us."

After showing that it was a great condescension for a Jew to say this thing, so opposite to both the Jewish and Grecian idea, he went on to speak of the light and darkness both thrown upon the relations of men by scientists. The speculation concerning the origin of the race is producing a two-fold mischievous effect. It unsettles the faith of some men, and others, seeing this, are driven away from all scientific reading. There is no doubt that the world is older, and that the race of man extends further back, than the six thousand years of chronology. But chronology is of purely human invention, and we touch no question of the Bible if we remove chronology thousands of years back. It is generally conceded by those who have the best opportunities of knowledge, that the present condition of things was developed from a lower condition. It is not a question of the Divine creative act (or need not be), but a question whether creation was unfolded by an instantaneous act or by slow evolutions. In regard to the creation of man we have

THREE THEORIES.

We have the theory of the creation of one pair, and all the rest descending from them. The second theory is that Adam and Eve were the ancestors of but one line, and that there were other lines. The third theory considers man as the natural outgrowth of the animal. This gives great offence to many on moral grounds, and to many on scientific grounds.

It is alleged that this theory cannot be sustained without leaving great gaps in the evidence. These speculations have had an effect on the public mind. Many inconsiderate and hasty persons have fallen from their faith and thrown away the Word of God. There are multitudes of men at the present time infected with the skepticism of science. These speculations lead the strong to domineer over the weak. It is said that the order of creation is that there are different planes, and the plane of one race is that of science to another. It is taught that rights belong to those who can defend them. Whatever theory may prevail of the origin of man will not prevent the fact that man has come upon the earth by a divine method, and it concerns us more to know what man is than how he came here. There will not be ultimately any incongruity between true science and true religion. For one I am a patient waiter as to how man became what he is. I am bound to receive light, let it come from what quarter it may. Let men investigate, and let men not refuse the truth when it comes, for the truth is the best for us all. I am sure in the meantime, that the race is one in such a sense that they have the same rights and the same duties, and the same heritage. All spiritual elements fit all men alike, and the questions of the future are not disturbed by ethnological conclusions. I don't care if one man came from alligators, another

FROM MONKEYS,

another from lizards, if I find that they are all susceptible of reasoning and training. The important question is settled, if we find we can work men up in the same way, now that we have them here. How absurd it is to speak of the anatomical structure as proving divisions! The substantial plan is the same; all the great functions are the same. If it were true that the African had his heart in his liver, that would be a tough argument. A surgeon or a nurse would treat all races alike. In physiology and anatomy, it is assumed that men are are; and yet men read the skeptical books that have been written, and garrulous, know-nothing talk about the difference between the flat nose and the Grecian nose. Isn't smell the same in one as in another? In some families you will find the child radiant with imagination, and the next will be cold and practical; one will be full of song, and the next will be dumb. There are no greater differences in the families of races than we find here in the family on a small scale. You can educate animals to a small degree, but there is no development in generation; but the minute you strike the human race, you find that the reason is there, and you can enlarge it in every way. Educate a savage and his children will be better than he was, and so on till you have the high state of culture. This is a striking proof of the unity of the race and the sharp line that separates man from the animal. The love of the beautiful and the perception of wit and humor belong distinctively to man. All men laugh, and nothing below men. If sobriety is a great grace, then dogs beat the soberest man on the earth. According to any scheme of development, how could this humor be found? So the moral sense is common to all. The sentiment of conscience belongs to the whole human family, for conscience is a feeling that acts according to the understanding.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of September, 1871:

During the month 873 visits of inspection were made, and 1791 boilers were examined—1624 externally, and 491 internally—while 117 were tested by hydraulic pressure. Number of defects in all discovered, 886, of which 103 were regarded as dangerous. The defects in detail are as follows:

Furnaces out of shape, 32—5 dangerous; fractures, 56—11 dangerous; burned plates, 49—5 dangerous; blistered plates, 104—3 dangerous; sediment and deposit, 150—12 dangerous; incrustation and scale, 137—13 dangerous; external corrosion, 69—10 dangerous; internal corrosion, 46—3 dangerous; internal grooving, 13—2 dangerous; water gages defective, 71—2 dangerous; blow out apparatus defective, 18—2 dangerous; safety valves overloaded, 27—5 dangerous; pressure gages defective, 103—1 dangerous, varying from — 10 to + 7; boilers without gages, 3—3 dangerous; cases of deficiency of water, 3—1 dangerous; braces and stays broken and loose, 10—2 dangerous; dangerous caulking, 1; boilers condemned, 19. Attention is particularly called to the danger arising from careless caulking of boilers. A case was found where the skin of the plate had been cut so as to produce a crack some ten inches long, after only two weeks' use. The careless handling of the caulking tool may do serious injury. Boilers fed from water tanks situated overhead are very liable to be injured from the water leaking down, causing external corrosion. Such a case was met with the past month. The iron was so thin that a chisel could be easily driven through at several points, while the boiler in the main was sound. These "little matters," if neglected, soon become serious. An engineer's eye should detect all such defects, and have them remedied. Too small boiler capacity, requiring heavy firing, is a danger to which we have often called attention. We allude to it again. An upright tubular boiler was found with the fire box burned out. The iron was only $\frac{1}{32}$ of an inch in thickness in many places, and a slight blow of the hammer penetrated it. The day before 50 pounds pressure of steam was used. Here was culpable neglect on the part of the owner or user and an engineer, in no way fitted for his responsible duties. If steam users will persist in over working boilers, and in using them when not provided with proper fittings and attachments, explosions must be expected. There were six explosions during the month, by which 21 persons were killed and 6 wounded.

COATING COPPER AND BRASS WITH ZINC BY A WET PROCESS.—M. R. Böttger (*Polytech. Notizblatt*) gives the following formula: Cover, with a concentrated solution of sal ammoniac, zinc in grains or powder, placed in a non-metallic vessel; warm to ebullition and introduce into the mixture the objects of copper or of brass which it is desired to coat, after having properly cleansed them. After a few minutes, the objects will be covered with a brilliant, firmly adhering, deposit of zinc. The granulated zinc is obtained by pouring the molten metal into a warm mortar, and triturating vigorously, with an iron pestle, until it solidifies.

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Water Supply and Farm Irrigation in Illinois--The Cost of Artesian Wells.

A correspondent of the Chicago *Tribune* gives an account of his visit to the agricultural portion of the State of Illinois, from which we extract as follows:

The question of water supply for farm stock is becoming one of no small importance in many parts of the State. Our prairie soils are capable of holding a large amount of water, but there are times, like the present, when a long continued drought exhausts this supply. It appears to me that one of the most important duties of the State Geologist is to give this department of practical geology his most earnest attention; for it is one that has much to do with agriculture.

A short time since, I spent a couple of days in the county of flowing wells, in order to learn something in regard to them. They vary in depth from 30 to 120 feet. The boring is through blue clay, such as is common to the northern part of the State, showing that the drift is of the same age as the country to the north and south of the location. Just before reaching the water, which appears to be infilliated through a fine white sand, which, in places, is more or less mixed with gravel, there is a crust, or shell, of cemented sand and gravel, about two feet thick, and of great firmness, through which the auger is forced with difficulty. The well laborers know that, when they strike this band of hard pan, as it is called, they are near the coveted water. As soon as the "water sand" is penetrated, the real difficulty is met; for, if the sand is fine—that is, unmixed with gravel,—it is forced upward, and often fills the hole so firmly that it is difficult to clear it out. The value of the well depends upon the quantity of gravel present in the "water sand," as this allows the water a freer flow upwards, while the fine sand is liable to pack so closely that little or no water can find its way to the surface.

BORING AND PIPING.

A two inch auger is used in the boring. This is made for the purpose by a blacksmith, and is similar to a common auger, with a pad of some twenty inches. The boring is done by hand, and the auger is raised with a common hand windlass, with ropes and pulleys attached to a common three-legged derrick.

It often occurs that the augur meets a small granite boulder. Then the boring is abandoned and a new hole started, generally within a foot of the first. Sometimes three or four of these holes are made. It is difficult to drill through these isolated pebbles that are scattered through the clay drift, for they have been rounded by glacial action, and the blows of the drill make them change position in the bed of clay; hence it is found to be the most economical to start a new boring, and try the chances of passing down without meeting them. Formerly a four inch hole was bored, and this was tubed for some thirty feet, with wood tubing; but the two inch hole is now considered the better size, and this is tubed with one and a fourth inch galvanized gas pipe.

After the hole is bored, and the flow of water ascertained, the point of the gas pipe tube is prepared. If the flow is free, indicating a gravel stratum, large orifices are made in the point; but, if the flow is limited, indicating fine sand, the orifices are made of less size. This is attached to the pipe, and a careful measurement made, that passes the point into the "water sand," which is often quite shallow; for, if the point should go into the clay below this sand stratum, the water would be cut off. Sometimes the sand fills up the tube, and shuts off the flow of water. In this case a small pipe is inserted in the larger one, and water poured into the larger one; and by thus producing a hydrostatic pressure, the sand is forced up through the small pipe, mixed with the water, and the tube is thus cleared of the sand.

As the water is filled with sand, or, rather, as the water makes its way through this thin sheet of sand, it is evident that the force of the pressure is feeble, and that the flow must be not only moderate, but limited, at any particular point, and that an enlargement of the boring will have little corresponding effect on the flow of water, which will remain about the same, as more depends on the presence of gravel than the size of the boring.

THE COST OF A WELL.

At the time of my visit, Mr. W. H. Mann, of Gilman, had just completed his fourth well. It was 104 feet deep. The cost is as follows:

Man and apparatus, four days, at $5 per day	$20.00
Two men, four days, each $1.50 per day	12.00
Hauling apparatus to and from well	3.00
104 feet pipe, at 27 cents per foot	28.00
One drive well point	3.00
Well trough	2.00
Total cost	$68.00

The usual price by the well jobbers is $1 a foot for the well completed.

In the village of Gilman, a few rods west of the depot, is one of these flowing wells, that serves to supply the inhabitants with water. The water of all these wells is very clear, but slightly charged with iron, which, in time, coats the vessel with its oxide. The temperature is about 52 degrees. It is used for all domestic purposes, except washing, where rain water is preferred.

ITS VALUE FOR IRRIGATION.

Mr. Mann had given it a limited trial on some beds of forest evergreen seedlings and cuttings of the small fruits; but, not being familiar with the management of water in this manner, only made a partial success. From what I could see of this one experiment, I have little doubt of its final success.

In irrigating, the land must be made even, that is, the water must run in small drains flush with the surface, but, at the same time, must not be allowed to overflow, as the water is to simply soak into the soil, and to fill it with watery vapor. In case it flows over the surface, it forms a crust that excludes the air, and is also liable to induce sun-scald of the plants, as we often see in the fields after a heavy rain, in places where the water stands on the surface for a longer or shorter period. That these flowing wells will materially add to the value of this part of the State, there can be no doubt. For the strawberry, nursery stock, garden vegetables, and grass, they must be invaluable.

The writer closes by recommending careful boring in all parts of the State to determine the water supply; and to this should be added a general topographical survey, connected with the Geological Department. Such a survey would no doubt show that the flowing wells of Iroquois county have their water supply from the east, near the Indiana State line; and it would also give us some idea of the bounds of this water district. Will some member of the Legislature look to these matters, and thus do something of practical value to the State?

NEW PUBLICATION---THE SCIENCE RECORD, FOR 1872.

We have in press, to be issued January 1st, a new book of 350 pages octavo, entitled as above, which, we think, will be read everywhere with interest. It will be a compendium of the scientific progress of the previous year, and is to be profusely illustrated with steel plate and wood engravings.

The following is a partial outline of the general contents of the *Science Record:*

Notices and descriptions of the leading discoveries and improvements invented or introduced during the past year, pertaining to Engineering, Mechanics, Chemistry, Philosophy, Natural History, Agriculture, Architecture, Domestic Economy, and the various Arts and Sciences, with many engravings.

Biographical notices of prominent men of science, with portraits.

Descriptions of the most important public works, begun or completed during the year, with illustrations.

Notes of the progress and extension of railways, telegraphs, and other means of communication.

Descriptions of the new applications of steam, electricity, and other motive powers, with engravings.

A complete almanac for the year, with the usual astronomical calculations, and a chronological table of notable scientific events and phenomena.

Reports of Patent Office proceedings. Classification of inventions at the Patent Office, with the names of all examiners, officials and employees.

Portrait and biographical sketch of the Hon. M. D. Leggett, Commissioner of Patents.

Full description of that great engineering work, the Mount Cenis Tunnel through the Alps, with engravings of the tunneling machinery, portraits of the chief engineers of the work, and other illustrations.

Description of the great Government works at Hell Gate, New York, with many illustrations, showing the wonderful galleries now being cut in the rocks under the bed of the East River, preparatory to removal of these obstructions by explosion, the drilling machinery, the electric apparatus, and other interesting objects.

Description of the great Suspension Bridge between New York and Brooklyn, now in process of erection, with interesting engravings.

Steel plate engravings of the celebrated Gatling Gun or Mitrailleur, showing its construction and use in various forms, upon wheels, horseback, camels, boats, etc.

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Grinding Wheat without Millstones.

A very remarkable paper the contents of which are of especial interest to that large portion of our readers engaged in the manufacture of flour, was read at the late meeting in Edinburgh of the British Association by Mr. Thomas Carr. The document consisted of a description of a new mill for grinding wheat, called a disintegrating flour mill, and claimed to possess such extraordinary advantages as to entirely supersede the use of burrs. The wheat is reduced to flour by percussion instead of grinding, being projected through the air unsupported and with extreme velocity. In passing through the machine it is struck by a series of bars moving swiftly in opposite directions; and Mr. Carr asserts that by the action of these bars the wheat is so instantaneously reduced to a proper condition for bolting that no injurious heat is caused. One of these "disintegrating" mills is in use by an Edinburgh firm and has been some time in operation; and Mr. Carr describes in his paper the advantages it is claimed to possess over the millstones which it is expected to supersede. It is said to be much less frequently in need of repair than millstones, to require the labor of fewer men, occupy less space and call for less driving power. To the saving in wages and incidental expense is added by Mr. Carr the exemption from loss by scorching and consequent saving of fire insurance—the latter item being, we judge, of more theoretical than practical importance. The distinguishing feature, however, of the recommendation which is offered of this novel device, is that by the avoidance of injurious heat, claimed as a result of the peculiar method of reducing the wheat by percussion, a superior quality is produced. The theory is—unless, indeed, the practical experiment has been carried so far as to establish it as a fact—that the instantaneous nature of the process prevents the evolving of heat; an object which it is certainly very desirable to attain.

It is not easy to gainsay an ascertained and demonstrated fact; and if Mr. Carr's representation of the working of this remarkable machine is founded throughout on actual trial, we can only wait for an explanation of what now appears a very surprising statement. That no heat is produced in the reduction of the wheat to flour, simply because the process is swift and sudden, is a circumstance which certainly does not harmonize with other manifestations of the effect of the instantaneous force. A bullet fired from a musket strikes a wall with as sudden contact as can readily be imagined, but it does not follow that no heat is evolved in the concussion. The amount of the force applied in reducing, the wheat determines the amount of heat generated and it does not appear that, in the process described the force exerted is less than in the ordinary method. In point of fact, it might be reasonably expectedthat the more sudden and instantaneous the concussion, the higher will be the degree of temperature observed.

The real virtue of the new disintegrating process may after all consist, not in preventing the evolvement of heat, but in speedily and completely remedying its effects. As the wheat is reduced while passing through the air, this rapid motion and exposure to the air may serve as an immediate antidote to the effect of the heat upon the flour, preventing, according to the claim of Mr. Carr, any injurious results to the product of the mill. As "the proof of the pudding is the eating," and a practical test the only conclusive argument—a fact which holds good in the manufacture of flour as strikingly as in any branch of industry with which we are acquainted—we shall wait with some eagerness for further reports of the working of the new process which is to revolutionize the flouring business and make the familiar mill burr an obsolete relic of the past.—*Leffel's Mechanical News.*

Lace Knitting Machine.

Mr. Henry Williamson, of Williamsburg, has invented a machine for knitting or crocheting lace, which consists in an arrangement of the hooks or needles so as to be capable of working independently of each other, and operated by Jacquard patterns, cards, or cylinders, with the thread guides all mounted on one bar. The object is to provide machines wherein the patterns can be varied to a great extent.

In this improvement, the arrangement and operation of the guides are the same as in other crocheting machines, except that, in this case the lateral movement of the guides is limited to crossing one or at most two needles, and all the guides used are mounted on one bar; while in the common arrangement the guides are divided among a number of bars, and the bars have a greater range of lateral movement, and are worked by a Jacquard mechanism to form the pattern.

Commonly, for making figured goods, there are from three to twelve of these bars, one above another, each having an equal number of guides arranged in the order of the said bars—that is, beginning at one end, one bar (say the top one) will have the first guide, the second bar from the top the second guide, and so on, repeating for every sixth or twelfth guide according to whether there be six or twelve of the bars; or they are sometimes arranged by twos or threes in each bar, but in the same order, and the said bars (as before stated) are worked laterally by a Jacquard to carry the thread across the hooks, according to the pattern to be made, one bar being moved laterally at each forward movement of the needle, while the others are allowed to rise and fall between the same needles, without supplying thread to them.

This arrangement is necessary to work out the patterns when the needles are all connected together, as in all the machines of this character heretofore made; and it has two important objections, which it is sought by the present improvement to avoid, namely: first, it necessitates the use of a large number of guide bars, and the supports and adjuncts thereof, which are objectionable and expensive; and second, with all the guide bars that can be used, practically, it is impossible to knit wide patterns; for there must necessarily be a repetition of the patterns as often as the order of the guides is repeated on the bars; with one bar only plain goods can be made. These objections are completely overcome by shifting the Jacquard to the needles arranged to work independently of each other, in connection with only one guide bar operating as described, and carrying all the guides, by which the single pattern may be as wide as the fabric knitted, with no repetition, as will be clearly understood; for the number of needles receiving the yarn at each movement, and the order of their receiving it, will be governed entirely by the pattern cards or cylinders.

AT the last meeting of the Council of Directors of the Iron and Steel Institute of Great Britain, it was decided that the next general meeting shall be held in London, on March 19, 20, and 21, 1872; and that special invitations be addressed to foreign metallurgists, soliciting the honor of their presence at the meeting.

WHEN a storm commences in the United States, the line of minimum pressure does not come from the "far west," but commences with the storm, and travels with it towards the eastward.

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Improved Torpedo Boat.

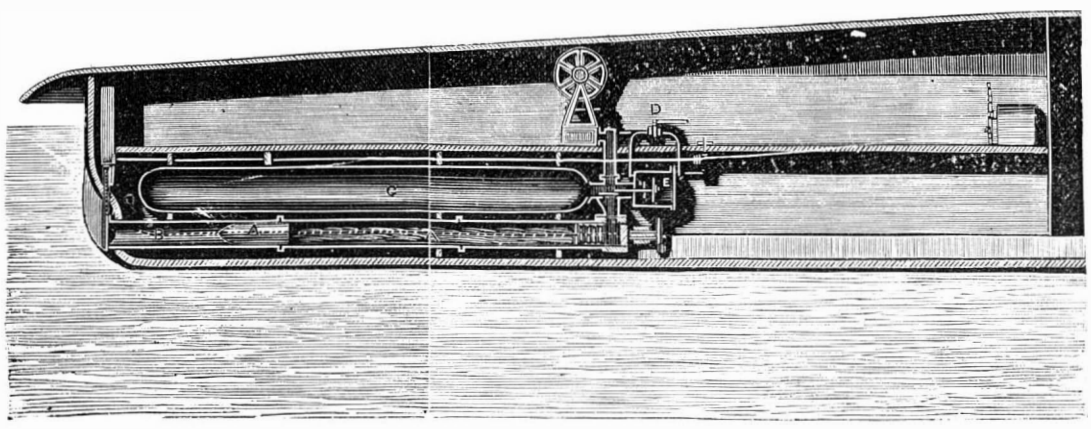
We illustrate, in the accompanying engraving, a torpedo boat, which was made the subject of a paper, read at the last meeting of the British Association, by Mr. Philip Braham. The torpedo, A, consists of a chamber filled with dynamite at the pointed end—a shaft of wood of any convenient length, and a corrugated iron cap, of sufficient weight to make the torpedo or submarine rocket float nearly horizontally.

The torpedo is propelled through a bored cast iron tube, B, from the boat, below its water line, by the expansion of compressed air.

The compression chamber, C, is a strong double riveted boiler, into which air can be compressed to 500 lbs. to the square inch, by machinery driven from the boat engines. The boat is plated to render it practically invulnerable; the boilers are high pressure; the twin screws, driven by a differential motion of novel construction, are below the bottom.

When the boat arrives within striking distance of the ship attacked, the officer in charge, who views the enemy by a mirror to prevent his personal exposure, turns the handle of a four-way cock, D, which admits air from the compression chamber under the piston in the cylinder, E, and opens the valve leading from the compression chamber to the tube, arranged so as to give a powerful, elastic, and prolonged impetus to the submarine rocket, which, strikes the enemy below the water line, exploding the percussion fuze, and smashing in square yards of the side

By the reaction of the force driving the rocket forward, which would average upwards of 80 tuns on 1 foot 9 inches, shown, the boat would have its speed considerably diminished, if not entirely neutralized. There is also a sluice valve and breech, whereby a fresh rocket can be introduced when the first has exploded.—*Engineer.*



BRAHAM'S TORPEDO BOAT.

Adjustable Elastic Measuring Scale.

Baptist Edme Chassaing, of Buenos Ayres, Argentine Republic, has invented a new adjustable scale and equi-divider, the object of which is to provide an improved instrument for quickly and accurately constructing a drafting scale, and for dividing lines within certain limits of length into equal parts, it being designed and adapted chiefly for use by the draftsman, civil engineer, and architect. A round rod of brass or other suitable metal, has a fixed head or radiating arm at one extremity, and a similar arm movable throughout its length, provided with a set screw. Throughout the length of the rod there is a small groove, into which pins upon the heads fit, preventing them from turning. Between the two arms is stretched an elastic rubber band, fastened to the arms. This rubber band is divided upon its four face edges into a certain number of equal parts, which are subdivided into equal minor parts, and is the scale proper. The band is a tube of soft rubber, about two and three fourth inches external diameter, one fourth inch wide, and about one twenty-fourth inch thick, being perfectly accurate in its dimensions and homogeneous throughout. A small pin, having a T shaped head and perforated with a small hole, works loose in the fixed head and is held in place by a washer and rivet or nut. The object of the circular form of band is two fold: First, to compensate for any tendency to unequal stretching. Second, to provide a means of attachment, without forcibly confining any portion of its surface between fixed jaws, or in any way reducing the strength of the band at the points of attachment by piercing or otherwise.

To use the instrument, let it be desired to provide a scale of one eighth, one fourth, one half, five eighths, three fourths, one, one and one fourth, one and one half, two inches, etc. Then imagine that one side of the adjustable band is divided into one hundred equal parts, and that its capacity is twelve inches. The ten inches equals eighty eighths; hence, if we apply the scale to a standard rule, making eighty divisions, equal to ten inches, upon the rule, we have at once an eighth scale. Secondly, ten inches equal forty fourths; hence, if we apply the scale to a rule making forty divisions, equal to ten inches, we have at once a one fourth scale, and so on for the remaining scales enumerated; but no one side of the scale will admit of all of these adjustments; hence the four edges are differently divided, to suit all requirements. Suppose it be required to measure a plan or map having a drawn scale depicted. It is only necessary to adjust the scale to the scale of plan or map, and use it accordingly. If it be desired to divide a line of length not greater than twelve inches—though lines of greater length, when required to be divided into equal parts not prime, may be also divided by previous subdivision—it is only necessary to extend or contract the band, using the edge giving the required number of divisions within the scope of the instrument, so that the required number of equal parts will correspond with the length of line to be divided; then point off with pen or pencil the divisions so indicated. This last feature of the instrument renders it essentially useful to the draftsman, as it avoids the old long and tedious way of stepping off with dividers, which often requires that a line should be frequently gone over, and, unless great care is taken, it is seriously marred. The band is made of white rubber, as soft and pliable as possible. It will, of course, be required to be made for this special purpose, and must be made with perfect accuracy of dimensions throughout. The divisions will of course be made by machinery, and all sides of the scale will be graduated when stretched to its utmost capacity. The figures will, however, be stamped upon the band when it is extended to half its scope, as they will then be most legible at all points of the extension.

The scale will be divided as follows, though other divisions may be found more suitable than those enumerated: First side, one hundred equal parts, subdivided into halves and fourths. Second side, fifty equal parts, subdivided into sixths. Third side, eighteen equal parts, subdivided into twelfths. Fourth side, eleven equal parts, subdivided into twenty fourths.

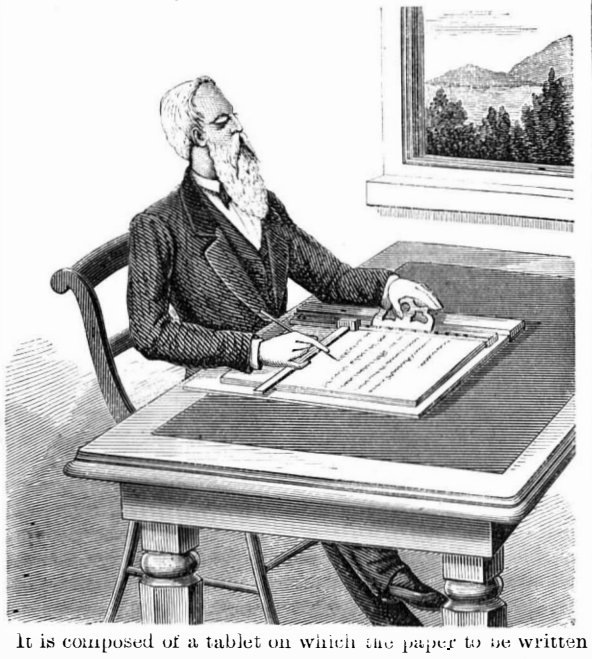
Fire Safes--Test of Material.

We have received, from an eminent chemist, the following suggestion:—"Can you induce some of the rich fire safe manufacturers to have an investigation made into the heat conducting and other powers of various substances, with a view to their use as an exterior covering of safes?"

No doubt many of our readers are interested in this question as safe makers and sellers, and many many more as safe buyers and users. Will any practical man let us know the result of a few experiments on this subject, which is now engrossing the attention of the public?

BRIESEN'S WRITING APPARATUS FOR THE BLIND, ETC.

The subject of the accompanying engraving differs materially from the general run of modern improvements, as it is not intended to perfect anything already in use, nor to subserve the comfort of the general public. The object is primarily to relieve that most unfortunate class of our fellow beings, the blind, from their chief enemy, inactivity; and also to prevent injury to or loss of the eyesight, in persons who find their sight failing by too close and constant attention to literary pursuits. In fact, this little machine is no more nor less than an apparatus by the aid of which one can write without using the eyes.



It is composed of a tablet on which the paper to be written upon is placed, of a spring clamp on the left side, whereby the paper is held firmly on the tablet, and of an adjustable hand guide which can slide up and down on a rod that is connected with the clamp. The hand guide is similar in form to an ordinary wooden ruler, and extends transversely across the paper.

The writer guides the little finger of his right hand along the top edge of the ruler, and is thereby enabled to carry the pen or pencil in a straight line. When a line has been written, a small knob at the left end of the hand guide is touched, and raised out of a notch in the rod *a*, which causes the hand guide to slide on the rod, until the knob springs into another notch and locks the hand guide in position for another line. The rod is notched at proper intervals from one end to the other, so that the hand guide will be arrested at each adjustment, to properly space the lines written.

The inventor considers the machine to be valuable for persons who have lost their eyesight after having previously learnt to write. For these it will be, as it has already been proved, a perfect boon, enabling them to occupy themselves, and giving them a degree of independence never before enjoyed by persons similarly afflicted. But also, literary men, clerks, copyists, and all writers whose eyes are materially strained by constant writing, are expected to profit by the use of this machine, as they may, by its aid, write without continuously looking at their work. The apparatus was patented through the Scientific American Patent Agency November 14, 1871. Those desirous of availing themselves of its benefits may address the manufacturer, V. E. Mauger, at 110 Reade street, New York city.

The Royal Condor.

The condor has been singularly unfortunate in the hands of the curious and scientific. Fifty years have elapsed since the first specimen reached Europe; yet to-day the exaggerated stories of its size and strength are repeated in many of our text books, and the very latest ornithological work leaves us in doubt as to its relation to the other vultures. No one credits the assertion of the old geographer, Marco Paulo, that the condor can lift an elephant from the ground high enough to kill it by the fall; nor the story of a traveler, so late as 1830, who declared that a condor of moderate size, just killed, was lying before him, a single quill feather of which was twenty good paces long! Yet the statement continues to be published, that the ordinary expanse of a full-grown specimen is from twelve to twenty feet; whereas it is very doubtful if it ever exceeds, or even equals, twelve feet. A full grown male from the most celebrated locality on the Andes, now in Vassar College, has a stretch of nine feet. Humboldt never found one to measure over nine feet; and the largest specimen seen by Darwin was eight and a half feet from tip to tip. An old male in the Zoölogical Gardens of London measures eleven feet.

The ordinary *habitat* of the Royal Condor is between the altitudes of 10,000 and 16,000 feet. The largest seem to make their home around the volcano of Cayambi, which stands exactly on the equator. In the rainy season they frequently descend to the coast, where they may be seen roosting on trees; on the mountains they very rarely perch (for which their feet are poorly fitted), but stand on rocks. They are most commonly seen around vertical cliffs, where their nests are, and where cattle are most likely to fall. Great numbers frequent Antisana, where there is a great cattle estate. Flocks are never seen except around a large carcass.

It is often seen singly, soaring at a great hight in vast circles. Its flight is slow and majestic. Its head is constantly in motion as if in search of food below; its mouth is kept open and its tail spread.

To rise from the ground, it must needs run for some distance, then it flaps its wings three or four times and ascends at a low angle till it reaches a considerable elevation, when it seems to make a few leisurely strokes, as if to ease its wings, after which it literally sails upon the air. In walking, the wings trail on the ground, and the head takes a crouching position. It has a very awkward, almost painful gait. From its inability to rise without running, a narrow pen is sufficient to imprison it. Though a carrion bird, it breathes the purest air, spending much of its time soaring three miles above the sea. Humboldt saw one fly over Chimborazo. We have seen them sailing at least a thousand feet above the crater of Pichincha.

Its gormandizing power has hardly been overstated. We have known a single condor, not of the largest size, to make way in one week with a calf, a sheep and a dog. It prefers carrion, but will sometimes attack live sheep, deer, dogs, etc. The eye and the tongue are favorite parts, and first devoured; next the intestines. We never heard of one authenticated case of its carrying off children, nor of its attacking adults except in defence of its eggs. Von Tschudi says it cannot carry, when flying, a weight of over ten pounds. In captivity it will eat everything except pork and cooked meat. When full fed, it is exceedingly stupid, and may be caught by the hand; but at other times it is a match for the stoutest man. It passes the greater part of the day sleeping, more often searching for prey at morning and evening than at noon—very likely because objects are then more distinctly seen. —*Professor James Orton.*

CLAY AND SANDY SOILS.—If you have a light sandy field and wish to fertilize it cheaply, perhaps you cannot do better than to gather, say ten loads of clay, and mix it with ten loads of barn yard manure or compost; this will be found as effective, perhaps more so, than twenty bushels of manure without the clay. And the reverse we believe, will also hold good; that is, to a stiff clay soil, add the same quantity of sand soil and manure; the texture of the surface soil is changed thereby.—*Virginia Real Estate Journal.*

A PIECE of building land, at the corner of the new Queen Victoria street, in London, has just been let at a rental of £5,500 per annum, being at the rate of about five dollars per square foot. Business must be better in London than in New York, at the present time, to enable the tenant to afford payment of such rental.

PROFESSOR GEIKIE, an eminent geologist and writer, is Sir Roderick I. Murchison's literary executor. Sir Roderick has left behind him voluminous papers and documents, and from these and from personal knowledge, Professor Geikie will write and publish a life of the renowned President of the Geological and Geographical Societies.

TRUST him little who praises all; him less who censures all; and him least who is indifferent about all.

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Saw Manufacture at Sheffield.

First, the saw is cut out of the sheet. If a heavy or large saw, it is never toothed while soft. The third stage is that of hardening. Placed in a structure like a baker's oven, and floored like a baker's oven with brick, the saws are left there to harden, and when they come out they are, when cool, brittle as glass. To abate this brittleness, they are put into a composition, where they lie, for a time, in a sort of oily bath. This makes the fourth stage. After this they are tempered over a coke fire, watched by men who, guided by their experience of color, take them out when they have acquired the tint which will leave them with a blueish hue, that indicates, to the practised eye, the amount of elasticity in them. At this point you may bend them like whalebone from heel to point, so elastic have they become. This makes the fifth stage. The tempering warps them, and they now require to be flattened. The flattening is the work of the "smithers," who hammer and beat them into an attitude of precision. This makes the sixth stage. Now the blades have to be ground and glazed. This makes the seventh stage. The saws, being now flat and bright, have their teeth "set," by the laying over the edge alternately, and with the setting the sharpening is associated. This makes the eighth stage. At this point it is necessary to restore to the saw blade the measure of elasticity which has been taken from it by the processes of rubbing and glazing, so it is put into the oven; for the mere rubbing or glazing of the saws does, somehow or other, extract from them a large amount of the elasticity imparted to them by the tempering process, and for this reason they are heated to restore to them their lost suppleness. This makes the ninth stage. When they come out of the oven, they have on them a sort of straw tinted bronzing, which has to be removed. To remove it, they are placed in a bath, which immediately takes it off. This makes the tenth stage The saw has now to be etched. This is the eleventh process. If a hand saw, it needs the hold for the hand or handle to be put on, and this is done with remarkable dexterity and when done the twelfth stage is completed. Nothing remains now but to have the saws examined. Messrs. Spears and Jackson, of Sheffield, make circular saws of from one inch to ten inches in diameter. These miniature circulars are exquisite specimens of the sawmaker's art, are chiefly destined for Paris, there to be employed by silversmiths and others in the production of those beautiful and ornamental articles for which Paris stands unrivalled. They also make saws on models which it is proved are from two to three thousand years old. These are for the Hindoos, and have the teeth set towards the handle, so as to cut by the up stroke instead of the down. Saws are of an almost infinite variety—some narrow as lengths of steel tape, some round and broad as a cart wheel or the top of a large loo table. Some have beautifully small teeth, others have teeth larger than a horse's. Some are destined for the most delicate operations of fancy cabinet work, and some are to be employed in sawing Bessemer steel rails by steam, at the rate of 800 revolutions per minute, while others are framed to spin along with a rasping sound all day long, cutting their way through the largest logs of timber in the naval dockyards.

The saw trade is a very ancient one, for the saw itself is figured on the ancient monuments of Egypt and Babylon. The cutting out of the edge in the form of teeth is done by machines, and where the teeth are small it is done at the rate of 400 per minute. The usual way to set the teeth is alternately to the right and to the left before completing the saw; but in the East, where ancient usages are preserved, the teeth of the large saws are bent aside in groups of perhaps a dozen each. The sharpening and setting of a saw requires considerable skill of hand and accuracy of eye; for if any one of the teeth projects either edgewise or sidewise beyond the true line, it renders the sawing harsh and difficult. When the teeth of a hand saw become blunted by use, they are sharpened again by means of a three-square file; but previously to this, comes a necessity for turning the saw to the fire where it is heated.—*Ironmonger.*

Metropolitan Railway of Paris.

We translate the following from *Le Moniteur des Intérêts Matériels:*

An important project was submitted to the Municipal Council in Paris during its last session. Its object was an underground railway to be completed by private enterprise, without subsidy, either from the State or the city. The scheme is not a new one, complete plans and designs of such a system having been presented to the Government in 1864, by M. Mouton. It is this project which has recently been again put into shape.

According to these plans, the railway will commence at Longchamps, will follow the course of the Avenue de la Grande Armée and the Champs Elysées as far as the Place de la Concorde, and, going along the Rue de Rivoli (the railway being the axis of the section of the main subways), will reach the chief market (Halles Centrales), and subsequently the depots of the railways of Vincennes and Lyons, and that of Orleans by passing over the Seine on a viaduct.

A branch will leave the main line at the Halles Centrales, going towards the depots of the Northern and the Eastern Railways, and rejoining the Belt Railway (Chemin de Fer de Ceinture).

Two other branches, leaving the Palais Royal station, will extend, one towards the depot at Saint Lazare (west, right bank of the Seine) and the other towards the depots at Mont Parnasse (west, left bank) and d'Orsay, by crossing the Seine in a tunnel and following the line of the Rue de Rennes.

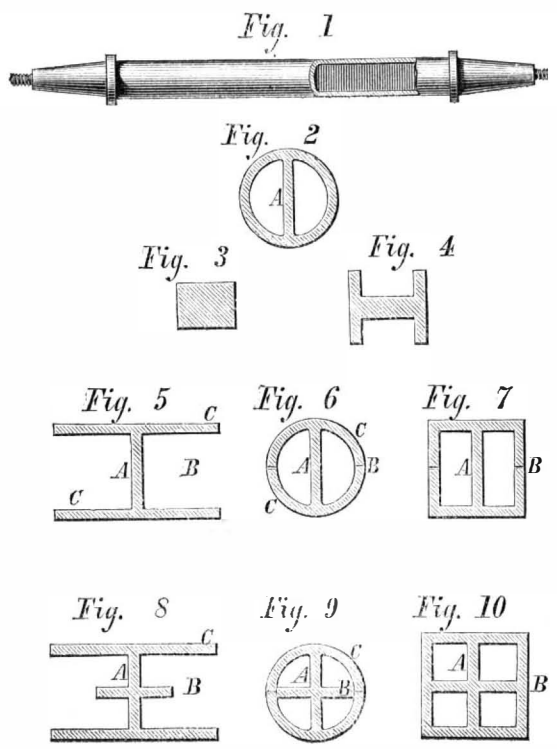
All the depots will thus be united to the Halles Centrales. The greatest depth under ground in this railway will be 13·5 meters, while the Metropolitan Railway of London in many places descends to a depth of 17 meters.

The tunnel will have a width of section of 60 meters; the surveys will be made similarly to those for the underground railways of London, which have been operated for many years past with complete success. When, seven years ago, this project was submitted for the first time to the Prefect of the Seine, it was returned for examination by the two engineers-in-chief of the city. M. Belgrand reported that the scheme gave every satisfaction to the needs of his important branch of the service, that of the subways. M. Alphand made the same declaration, subject to his examination of the design for the station to be established at Longchamps.

This great work deserves the attention of the Municipal Council. There are no technical difficulties to hinder the construction of a network of subterraneous ways in Paris; and we believe that statistics of the probable traffic will convince the public that the capital employed will obtain a large profit.

IMPROVED AXLE FOR RAILWAY CARS AND LOCOMOTIVES.

What proportion of all the destructive accidents on railways originate in the breaking of axles, we have not statistics at hand to determine. It is certain, however, that much destruction of life and property has arisen from this cause. On the 6th of February, of the present year, the public was horrified by the account of such an accident, at New Hamburgh on the Hudson River Railway, the terrible details of which are still fresh in the minds of all our readers.



This instance alone, of the many similar ones that might be recorded, is enough to illustrate the importance of any invention giving greater strength and security to axles. Such an invention will be appreciated, not only by those who incur the personal risks of railway travel, but especially by railway companies, whose interest it is to avoid all such disasters and the pecuniary loss and reputation for insecurity resulting therefrom.

Such an invention we herewith present to our readers. It furnishes, without doubt, a much stronger axle in proportion to its weight than are the axles at present in use; and experts who have examined it assert that it can be made as cheap, or nearly so, as the ones now employed.

The strength of a given weight of metal, when formed into a hollow cylinder, has long been known to be much greater than when wrought into a solid cylinder. Galileo was the first to demonstrate mathematically the proportionate strength of hollow and solid cylinders. He showed that the resistance of a hollow cylinder is to that of a solid one, of the same length and weight, as the radius of the hollow cylinder is to that of the solid one. According to this formula, the strength of a hollow cylinder, the metal of which would make a solid one of the same length and one twentieth the diameter, would be 4·47 times stronger than it would be were it wrought solid. The theories of Galileo relative to the strength of materials were based upon the assumption that the fibers of beams are neither elongated or compressed by the strains to which they are subjected, each acting with equal energy throughout their cross sections. Robert Hooke, in 1678, announced the fact that fibers are compressed on the lower side and extended on the upper side of beams subjected to downward transverse strains. Mariotte, in 1686, investigated the position of the neutral axis, or the points in the sections of beams, subjected to neither extension nor compression; and the results of his researches were confirmed by Leibnitz in 1684. Parent, in 1713, published the following principle, namely, that "the total resistance of the compressed fibers equals the total resistance of the extended fibers." Coulomb, in 1773, generalized this principle to make it applicable to beams upon which forces are applied in an oblique direction. In 1807, Young investigated the *modulus* of elasticity. Other investigators followed these researches, adopting some false principles, but all struggling to arrive at truth on a difficult subject, some points in which are still matters of debate. The reader will find much interesting historical matter in connection with the subject, in Wood's "Treatise on the Resistance of Materials," published during the present year by John Wiley & Son, New York, and from which the above synopsis is compiled.

The result of all these labors has led to the construction of formulæ different from that of Galileo, based upon the results of extended experiments with various kinds of materials. The relative strength of solid, as compared with hollow, beams, has not received the share of attention that, in our opinion, its importance demands. And although it has been shown that a tube of rectangular section, whose hight is considerably greater than its thickness, will sustain a greater amount of lateral pressure than a hollow cylinder of the same thickness, it is obvious that this can only be the case when the strain is applied in one direction.

The results of actual experiments are better guides for the estimate of relative strength of hollow and solid cylinders than any formulæ that can be adduced.

A round tube, whose external diameter is to its internal diameter as 10 is to 7, has, according to Tredgold, twice the strength of a solid cylinder of the same length, material, and weight.

Experiments conducted in England, in 1842, an account of which is given in the *Mechanics' Magazine* (Vol. XXXVIII., page 254), gave the following results: "A weight of six hundred pounds was allowed to fall from a hight of nine feet upon solid railway axles, and with that force they were frequently broken at the second blow, and sometimes at the first; while, by letting ten hundred pounds fall on hollow axles from a hight of fifteen feet, not one of them was broken."

The invention under consideration consists in the construction of tubular axles, round, oval, or square, with one or more interior longitudinal strengthening webs or supports. The object of the invention is to manufacture all sorts of axles, which will be much stronger, lighter, cheaper, and better lubricated than any axles now in use.

Fig. 1 is partly a side view and partly a longitudinal section of a cylindrical axle so constructed. Fig. 2 is a transverse section of the same. Fig. 3 is an end section of a bar of which the axle is made. Fig. 4 is an end section of the same, after once passing through the rolls, and indicates the manner in which the completed blanks, Figs. 5 and 8, are produced. Figs. 6 and 7 are forms produced from the form shown in Fig. 5, and Figs. 9 and 10 are made from the form shown in Fig. 8, by uniting the edges of the parts, C, at B, and properly welding them there. Fig. 6 is an end section of a vehicle axle, with one internal longitudinal web, to strengthen it and prevent it from collapsing. Fig. 9 is an end section of a railroad axle, with a perpendicular web, crossing a horizontal one at right angles.

The hollow chambers in the axle have been found to afford great facilities for lubricating, and it is quite evident that the addition of the web to the hollow cylinder forms the lightest and strongest axle that can be made on any principle yet discovered; and, from the amount of metal saved, we should judge that it is also the cheapest. Such axles may be rolled or cast, and, by recesses of suitable shape in the rolls or molds, they can be made square for about ten inches inside the collar washer, to receive the clips which hold vehicle axles from rotating.

The internal webs prevent the buckling of the external tube without great increase of weight, and the strength thus gained is self evident. We see no practical reason why such axles as these should not be generally adopted, and if this be the case, the invention will give rise to an extensive and important branch of industry.

It was patented, Oct. 31, 1871, through the Scientific American Patent Agency, by Joseph W. Cremin, 213 East Fifty-first street, New York, who may be addressed for further information.

Leland's Galvanic Battery.

This invention has for its object to produce an electric battery which will operate continuously without requiring attention, as long as it remains provided with the requisite exciting substances. The invention consists in placing within the porous cup, containing the platinum element, sulphate of mercury alone or mixed with black oxide of manganese, and in surrounding the cup with water, which is in contact with the zinc. This combination, it is claimed, produces reliable action, and is very economical, as the spent sulphate of mercury falls to the bottom of the cup in a shape to be readily reconverted.

The inventor states that, by connecting the poles of the platinum and zinc plates, a steady action is maintained until the sulphate of mercury is entirely decomposed and falls to the bottom of the cup as metallic mercury, ready to be reconverted into sulphate of mercury. This insures great economy.

This battery will, it is claimed, work weeks or months without attention, except perhaps the filling up of evaporated water, and the supply of sulphate of mercury. No acid being required, offensive fumes are avoided, and much steadier action is insured.

The improvement is the invention of Mr. Edwin J. Leland, of Worcester, Mass.

AN English author, Miss Meteyard, remarks in her life of Wedgewood, that the earliest mention of the photographic art is a discovery by Thomas Wedgewood in 1791. She gives a *fac simile* of the earliest sun picture on record, and states that she has traced the connection between the Wedgewood family and the Frenchman Dominique Daguerre. This version of the origin of the universal and beautiful art of photography shows it to be much older than people generally suppose, and adds an additional lustre to the name of Wedgewood.

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Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Street Cars.---Atmospheric Engines.---Economy in their Use.

To the Editor of the Scientific American:

Your article last week in regard to the propulsion of street cars by steam, and your expressions contained therein, in regard to the want of street car companies of a reliable and cheap means to take the place of animal power, have brought to my mind some reflections which, I think, may be of service and interest to your readers. It is a fact, long since patent to every thinker, that the humane spirit of the age is much averse to the killing of horses by their use in street car propulsion, and loudly calls for some radical improvement in that direction. It is further true that street car companies are ready, willing, and waiting to "look at" something that will meet the want, if it will diminish the cost of running cars.

For two years past I have given much thought upon this matter, have visited numerous street car companies' offices and stables, and have learned the want; and I will, if agreeable to you, give some facts, as I have gleaned them, as I often see that you urge upon your readers that "one fact is worth a thousand theories."

I find that there is a prejudice against any vehicles, in a street, not drawn by a horse. This, however, is only a matter of education, and will vanish as soon as the coming man will bring forward a machine which will move street cars back and fro, with the conditions substantially as set forth below. These are things which must be attained, and which education cannot overcome.

One important feature is simplicity. It must be of such ease of manipulation that any common laborer of ordinary sense can be "picked up" and in a few hours made master of the situation, in starting, running, and stopping a car. This makes it practicable for companies to run their cars without hindrance and with economy.

It is necessary that the machinery to run each car should be under it, or in such manner concealed as to hide such deformities as are repulsive to the presence of human beings and the eye of brutes.

The absence of fire, smell, smoke, and the accompanying sense of danger, and the use of all the space above the wheels for carrying capacity, are required.

It imperatively demands that no extra car or dummy should be used. It is a very great matter to get rid of the extra weight and wear and tear of machinery incident to carrying the motive power on extra wheels. The percentage of repair and necessary help to run the same operates fatally. In other words, when the coming man shall discover the means of running street cars without carrying the motive generator or power with the car in such weight and bulk as is required in the use of steam, hot air, furnace, etc., there will be a revolution in running street cars. If the coming man can place, say a 100 horse power engine in some by-alley or to one side, and with one engineer and fireman propel successfully thirty to fifty cars, then it will begin to look as if things were assuming shape.

Great exertions have been made to accomplish this desired end in the transmission of air. To this end I have made various experiments, and for the benefit of those whose minds are running in this direction, I will give some of the results. I find it expensive to condense air at high pressure. It must be worked, say at forty pounds to the inch, and better at thirty. It is so very subtle that, in order to condense it without too great a loss from leakage, it is necessary to have machinery in the very finest condition, and it must be kept so. It requires a large tank to draw from. It is only successful to use a large reservoir, with which the engine can be in constant connection. This gives regularity in the motion of the engine.

The engine for using compressed air is substantially the same as for steam, with the exception that it should be somewhat freer in the exhaust. It is impracticable to carry a tank or tanks on the cars filled with air. It is nicer and cheaper to place springs on the axles, and wind them up by steam or horse power. But this plan is not practicable. Such power is not reliable, and cannot be depended on under the various circumstances in which a street car is found. For instance, the wheels slip, as in sleet and wet; the power calculated to take the car to the next railway station is not enough; it is wasted in the slipping. Besides, it becomes clumsy, and lacks the essential simplicity spoken of above.

The cost of compressed air, forced into a large tank by engines and windmills, is trifling compared with horse power. For instance: It costs, say, in Chicago on the south side, at least fifty cents per day for feed and grooming a horse. They run eighty cars and use 500 horses. This foots up to the snug little sum of $250 per day for motive power alone. Two men can run a 125 horse power engine with three tuns of coal, at a cost of $20 to $25 per day for motive power. Now you have the wear of horses, harness, and shoeing, with the interest on capital in stable and fixtures to offset the repair of engine in compressing air.

You see the snug little difference that will appear to the capitalist's eye of at least $225 per day, or $82,125 per year, counting Sundays, one of the best days for street car travel. This is no idle chimera; it only wants the coming man to apply this force in the manner above mentioned. By the use of air from large reservoirs, much longer street cars can be used for early and late travel in large cities, to take operatives to their work and home at night. This is a want in cities. In fact, some strong, reliable power must be devised to bring the suburbs of cities into close proximity, as it were, to the center. It will greatly enhance the value of suburban property, as well as property down town.

Inventors will bear in mind that the first cost of putting down apparatus, pipes, machinery, etc., to run street cars, does not cut such a figure as might first appear. The only questions are its permanence and cheapness of operation after it is finished.

Hurry up, the coming man, and solve the great problem of threading cities with neat, quick, and comfortable street cars, passing and repassing with undeviating regularity. They will be a boon.

A. R. C.

Lincoln, Ill.

Curious Freak of Twin Steam Boilers.

To the Editor of the Scientific American:

Will you allow a constant reader of your paper to lay before your readers the mysterious working of two flue boilers in the packing house of Messrs. Nossingers, Tobey & Co., Kansas City, Mo.?

The boilers are set in brick work, having a partition wall between them, the gases passing off through a sheet iron stack. Each boiler is sixteen feet long and forty inches diameter, with two twelve inch flues. They are connected below by a mud drum, ten feet long and fourteen inches diameter; the stand pipes, connecting mud drum to boilers, are each two feet in length and two inches diameter. Feed water is fed through the check valve at one end of the mud drum communicating to each boiler.

Steam connections between boilers are made of two inch pipe, tapped in, on top of each boiler, three feet from front end, and rise vertically twelve inches to where elbows direct the pipe across and connect the two boilers; from a tee, midway between the boilers, in this pipe, rises another pipe, nine inches in length, and to this the safety valve is attached; the steam pipe then takes its course over the partition wall, leading to engine tanks and elsewhere in the house.

The mysterious working of these boilers is that the same water level cannot be maintained in both boilers. Two, and sometimes three gages of water would fall from one boiler and fill in the other, changing at regular intervals from one boiler to the other.

To bring the return of water in the empty boiler, the furnace and sometimes even the connection doors had to be opened on the empty boiler. Even firing was maintained at all times. The boilers were clean, and driven wells supplied the feed water. Cold feed water was used at times, and even warm and quite hot water at other times, but all to the same effect.

My experience of handling steam boilers of all kinds extends over a period of over ten years, and the working of the boilers in question is a new case with me; and I would wish to have the decision, of older engineers than myself, as to the cause and the remedy for the same, given in your paper.

Two other large packing houses at this place have boilers set in the same manner as above, and at both places a water level in both boilers cannot be maintained.

H. P. S.

Wanted, a Substitute for Whalebone.

To the Editor of the Scientific American:

Allow me to call the attention, of the numerous inventors who read the SCIENTIFIC AMERICAN, to a new article on which to experiment. It is an established fact that whalebone is growing scarcer and higher in price every year, and disasters, like the recent one to the whaling fleet in the Arctic sea, send it up to an enormous price. Whoever will discover a satisfactory substitute for this article has the prospect of large reward. Steel has been used to some extent as a substitute, but it is not satisfactory. Some experiments have been made with rawhide, but the results attained, so far as I know, have not been very successful. The important point to aim at, is to get a substance that has the required degree of elasticity, without liability to break.

New Haven, Conn. J. H. FOY.

[The above statement is very *apropos* to our recent editorial on the "Dependence of further Mechanical Progress upon the Discovery of New Materials." We hope our correspondents will make public all such requirements.—EDS.

Artificial Stone.

To the Editor of the Scientific American:

Feeling, as I do, a vital interest in all improvements, and seeing, in the last number of the SCIENTIFIC AMERICAN, an article on artificial stone which pleased me much, and being qualified to confirm, by experimental and practical experience, its durability, I submit the following:

In the year 1855, I made a piece of flagging, 16 inches by 24, 2 inches thick, in the following way: I made a mold of the above size and filled it with granite stone chips, then with mortar, of Portland cement and coarse sand, equal parts. I floated it off and when set, brushed it over with clear cement and then left it to harden. It is in the street, and subject to the action of frost and carriages, and is as perfect as when first laid.

ELIJAH MYRICK.

Ayer, Mass.

WATERPROOF STARCH is the subject of a French patent, and consists in passing the goods, after being properly starched, through a bath of chloride of zinc at a temperature of about 60° Fahr. The starch will then remain in the clothes after several successive washings.

HE who can suppress a moment's anger may prevent days of sorrow.

[For the Scientific American.]

UNITS OF HEAT AND OF FORCE.

As the word unit is so much used at the present day in relation to heat and power, it may be well, for the benefit of some readers not clear on this subject, to give a few words of explanation.

It is evident that the mere mentioning of the temperature of a certain amount of hot water can by no means be considered a measure of the amount of heat consumed to heat the same. Let, for instance, the water in the boiler of the steamer *Westfield*, which recently exploded, and which contained nearly 600 cubic feet or 36,000 pounds of water, be heated to 274° Fahr., so that, to water of 54°, some 220° had been added in order to raise it to the temperature corresponding with a pressure of twenty-seven pounds, by which it is said that it exploded. Then it is evident that these 220° are by no means a measure of the amount of heat given by the furnaces to that boiler, as a single pound may be heated to the same degree, with evidently one 36,000th part of the amount of heat required for the 36,000 pounds; it is therefore, in order to give a correct measure of the amount of heat, necessary to take in account the amount of material which was heated, and it has been agreed to take one pound of water in connection with one degree of Fahrenheit's scale as a unit, and to call a unit of heat that amount of heat required to heat one pound of water one degree. Therefore heating one pound 220° or 220 pounds one degree indicates, in either case, 220 units of heat; but heating 220 pounds 220° indicates $220 \times 220 = 48{,}400$ units of heat. And the *Westfield* boiler, if it contained 36,000 pounds of water, diffused by its explosion $220 \times 36{,}000 = 7{,}920{,}000$ units of heat, in case the pressure was only twenty-seven pounds, and consequently the corresponding heat 274°. The number of pounds of water multiplied with the number of degrees it was heated, gives us a product expressing what is called the number of units of heat.

It is the same with force. A number of pounds alone expresses no force, and it is totally erroneous to speak of a force of say 100 pounds, because when they stand on the floor and are not moving, they are a mere dead weight; but lift them against gravitation, and then you have to exert a force to do this; or let them descend, and they will exert a force themselves, proportional to their amount. But even then the mere mentioning of the number of pounds gives no measure of the force expended or obtained, because it is evident that it takes twice the amount of labor to lift them two feet that it does to lift them one foot; and inversely, it is clear that in descending they will produce an effect proportional to the space they descend. For this reason also here a second element is introduced, the foot, and it has been agreed to accept as a unit the force required to lift one pound of matter one foot high, so lifting 100 pounds one foot or one pound 100 feet is 100 units, and lifting 100 pounds 100 feet high is 10,000 units of force.

To use this as a correct measure, the weight must be lifted so many feet perpendicularly against gravitation, and not be hauled up against an incline of say 100 feet long; one pound moved in this way would not indicate 100 foot pounds, but, in case the raise of the incline was one in ten, only ten foot pounds. Much less must the space of the weight, moved over a horizontal plane, be taken as the measure of distance, as I have once seen done by a school teacher, who, to find the number of foot pounds of the power of a locomotive, multiplied the number of feet the train advanced in a minute by the whole weight of the train, and obtained several billions for the number of foot pounds. This would suggest a few millions of horse power for a single locomotive, and be only correct if the locomotive lifted the whole train perpendicularly upward in the air with the ordinary velocity at which it moves forward. In this forward motion, the force expended is, if there are no inclines, solely expended in overcoming friction and the resistance of the air; and, of course, this may be estimated in foot pounds, but does not compare with the weight and velocity of the train, any more than the velocity of a steamer has anything to do with its weight; its engine only overcomes the resistance the water offers to its progress.

The unit of force has therefore been called the foot pound, and in order to find it, we have only to multiply the number of pounds lifted with the number of feet they are raised. So in regard to the Brooklyn water works, which raise the water 170 feet high, every pound of water has to be multiplied with this number; and every pound of water used by the citizens represents a force of 170 foot pounds spent in the labor to bring it to his dwelling. The engines there throw, every hour, 2,000,000,000 pounds water into the reservoirs, representing a force of $170 \times 2{,}000{,}000{,}000$ or 340,000,000,000 foot pounds per hour.

It is evident that these standards, of units of heat and force, are arbitrary, and only conventional like other standards of measurement; but they have been of the most eminent service in making researches and experiments positive, and I conclude in stating that the French have adopted similar standards, founded on the decimal and metric system, but which are easily reduced to the American standards. The French unit of heat is one kilogramme water heated one degree of the centigrade scale, and of force, one kilogramme lifted one meter high; and they use in place of our "foot pound" the expression "kilogram-meter." As a kilogramme is nearly 2·205 pounds, and the centigrade degree equal to nine fifths of the Fahrenheit, the French unit of heat is $2{\cdot}205 \times \frac{9}{5}$ or nearly four times larger than ours; while the French unit of force is $7\frac{1}{4}$ times ours; the meter being 3·3 feet, this, multiplied with the value of the kilogramme in our pounds, 2·205, gives 7·2766 or about 7 28, when more accuracy is required than is obtained by the round number $7\frac{1}{4}$.

New York city. P. H. VANDER WEYDE.

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[For the Scientific American.]

DECAY OF STONE AND BRICK.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

The rapid disintegration or decay of the brown stone, so generally employed in the construction of New York houses, leads naturally to the consideration of the causes producing this decay, and also to the examination of other building materials, and the discussion of their merits or demerits as compared with brown stone.

The chief causes of disintegration of stone and brick are:

1st. Roughness of surface, favoring the deposition of dust.

2d. Vegetable growths, favored by dust and moisture.

3d. Percolation of water through interstices and fissures.

4th. Action of frost.

5th. Action of acid vapors in the air.

In the experiments we propose to relate, the materials employed were the same as those mentioned in a previous paper, namely, brown stone, Nova Scotia stone, red brick, and white brick. Submitting these to a microscopic examination under a power of twenty-five or thirty diameters, a very instructive lesson regarding the structure of these materials is obtained. The stone is seen to be composed of various sized particles loosely aggregated together, and presenting a very rough surface; the red brick is smooth, the fracture showing interstices of considerable size, while the white brick is not only smooth, but also dense, the interstices being very small; and every here and there minute spheres of molten glassy material are discoverable, showing the intense heat to which the brick has been subjected. Such a microscopic examination affords, to the architect and engineer, indications regarding the probable weathering power, which should never be overlooked in the selection of building material to be used in exposed locations, for the rough imperfectly cemented material not only favors the deposition of dust, which, being chiefly organic, furnishes a suitable nidus for vegetable growths, but it is also, by virtue of its structure, more friable, and therefore easily disintegrated by the forces to be considered hereafter.

The vegetable growth, of which we have spoken above, is a minute lichen, known as *Lepra antiquitatis*, and it grows with remarkable freedom on such hygroscopic rocks as the sandstones, as any one may satisfy himself on examining the houses on the cross, or east and west, streets of our city.

The percolation or passage of water takes place even in the ensest rocks, as trap and basalt, for, in the interior of even the most compact specimens of these rocks, spots of moisture are often found on breaking them, and Bischoff states that these are always connected with minute fissures, the edges of which often show effervescence when they are touched with acid, thereby demonstrating that water may convey into, or produce, carbonates, even in these dense rocks, and thereby alter their structure. This being the case with compact rock, we can form some idea of the manner in which percolating water acts on such loosely cemented material as the different kinds of sandstone.

Of the agents engaged in the disintegration of rock, one of the most efficient is frost. In its action, two elements are involved, namely, the friability of the material and its hygroscopic power. The difficulty attending the direct application of cold in the examination of the action of frost, has led to the use of other and similar means. Among these none is better adapted for the purpose in view than that of dipping the material to be examined in a saturated solution of sulphate of soda, and allowing the salt to crystallize when the specimen has been thoroughly saturated with the saline solution. The crystallization of the sulphate of soda, on and in the substance, brings to bear upon its particles the same kind of force as that produced in the crystallization or freezing of water, and particles are torn off or separated exactly as in the latter operation. In employing this test I soaked the rock in the solution for about four hours, and let it dry and crystallize for twenty hours. The loosened material was washed off by a fine jet of water from a washing bottle, the sample redipped for four hours, and again set to crystallize. This was repeated eight times, the experiment extending over a period of eight days, with the following results:

TABLE I.

Brown stone	10,000	parts, lost	191	of substance.
Nova Scotia stone	"	"	441	"
Red brick	"	"	74	"
White brick	"	"	24	"

The disintegration is very nearly in the ratio of 1 for the white brick, 3 for the red, 3 for the brown stone, and 18 for the Nova Scotia stone, a result which furnishes information of the greatest value from an economic point of view, and which cannot be too strongly insisted upon in a country where so little attention is paid to the durability of public and private edifices.

The long periods of time, required for the performance of the crystallization test, led me to make a series of experiments to find a quicker method for arriving at a reliable determination of the friability of these substances. The plan I endeavored to apply was to heat the specimens to a temperature of about 600° Fah., and then quench them while hot in cold water. The sudden chill and formation of steam on the surface of the masses caused them to disintegrate superficially, the amount of material removed, after the repetitions of the chill, being:

TABLE II.

Brown stone	10,000	parts, lost	202	parts	of substance.
Nova Scotia stone	"	"	597	"	"
Red brick	"	"	82	"	"
White brick	"	"	43	"	"

which gives a ratio of 1 for the white brick, 2 for the red, 5 for the brown stone, and 14 for the Nova Scotia. These results do not agree exactly with those given by the sulphate of soda test, but they approach them more closely than could have been expected considering the different character of the force applied.

Though the chilling test described above may be objected to as not meeting the conditions prevailing during the action of frost, but being rather the opposite, on account of the employment of heat in place of cold, it gives results which are very significant when viewed in relation to the power of brick and stone to resist the destroying action of great conflagrations. The conditions of the experiment are almost identical with those presented by a building on fire, for in each case the substance is alternately heated by the flames and chilled by the water thrown to quench them. The table therefor gives a very fair estimate of the relative powers of the materials in question to resist such destructive action.

The chemical ingredients of the air that act on building materials are carbonic, nitric, sulphuric, and sulphurous acids. The first of these is always present as the product of combustion, and, when dissolved in rain water, forms a solution which readily dissolves marble and other limestones, and even acts on dense granite and other rocks. Sulphuric and sulphurous acids are both found in appreciable quantity in the air of all localities where coal is used as fuel. Nitric acid is, in its turn, at times an ingredient of the air, especially after great display of lightning; it also is produced under certain conditions during the decomposition of organic matter containing nitrogen. To determine the action of these acids on the materials with which I was experimenting, I placed portions of them in dilute nitric acid, and left them in contact with the liquid for two weeks. I then kept them in water for ten days, changing the water every day to insure the removal of all soluble material; they were then dried, and being weighed, gave the following results:

TABLE III.

Brown stone	10,000	parts, lost	214	parts	of ssubstance.
Nova Scotia stone	"	"	66	"	"
Red brick	"	"	33	"	"
White brick	"	"	7	"	"

In which the ratio of disintegration is 1 for the white brick, 5 for the red, 9 for the Nova Scotia stone, and 30 for the brown stone. From this it would appear that the reason the brown stone disintegrates so rapidly in our city is its greater susceptibility to the action of the acid products of organic decomposition and combustion, where the cementing material is dissolved or weakened, and pores and fissures in the rock being opened, it is less able to resist the attack of frost. The Nova Scotia stone, on the contrary, is a more friable material than the brown stone; yet being less acted upon by the acid waters, it resists the process of decay better. The superiority of the white over the red brick, in this respect, is even more marked than under the other tests, and, taken with them, gives unquestionable evidence of the weather resisting power of this hard burned compact brick.

[NOTE.—In our article on this subject last week, an error appeared in Table I., in part of our impression only. The loss of moisture of Nova Scotia stone should have been printed as 426, instead of 260.—EDS.]

OCCASIONAL NOTES.

BY G. E. H.

Amsterdam, 1871.

THE GREAT SHIP CANALS OF HOLLAND.

Previous to the completion of the great North Holland Canal, the larger vessels of the Amsterdam trade were obliged to discharge their cargoes outside of the Amsterdam harbor, and were themselves lifted over the bar, at the mouth of the Ij, by means of large "camels," first sunk on either side of the ship, and then rendered buoyant by pumping the water from them by hand pumps; but, in 1825, the opening of the canal, and the improvements of the harbor, afforded a safe sea channel for the largest East Indiaman, avoiding both the delays at the bar, and the difficult and dangerous navigation of the Zuider Zee.

The harbor then was reclaimed from the south bank of the Ij, and consists of two immense dykes or dams, nearly parallel with the quay front, which likewise serves the additional purpose of protecting the town from inundation. Between the two dykes extend two rows of immense piles, with openings left at intervals between them, to allow the passage of ships, which openings are uniformly closed at sundown by large booms.

To reach the North Sea, vessels pass westerly along the channel of the Ij into the Wyker Meer, and thence through the canal proper to the Helder, a distance of 51 miles.

The engineering of this wonderful work of utility, which is 124 feet wide at its surface, and 21 feet deep, overcame enormous difficulties in its construction through the low swamps and loose sands of North Holland; while to secure a safe foundation for the locks, (which are the largest known) excavations, 43 feet below the present surface of the sand, were necessary. This work occupied Blanken, the engineer, six years, and had cost, when opened, $7,500,000.

Still more to facilitate her commercial relations, Amsterdam is at present constructing a new and more direct route to the sea, which shall not only shorten the distance by 35 miles, but also add to the many acres already reclaimed from watery dominion. This work, to be called the Great North Sea Canal and Harbor of Refuge, is under the direction of Mr. Hawkshaw and Mynheer Dyrks, and was commenced in 1867, with the then expectancy of completing it in 1876. To Mr. Hutton, the resident engineer, our thanks are due for his kind attentions and information concerning its details.

The scheme commences by throwing an immense dam across the harbor, at the junction of the Pampas with the Ij, founded in a lake of mud on 10,000 of the longest piles. This dam, provided with immense sluices to pass vessels and keep out the Zuider Zee, was formally opened some ten days previous to this writing.

Westerly from the city, extends the canal, which is formed, not by excavation, but by enclosing a riband of the Ij between two large parallel dykes, 250 feet apart; and founded, as the harbor dam is, upon piles driven deep into the muddy bed, near the northerly bank. Through the peninsula of Buitenhuizen, the canal is excavated, but enclosed again by dykes across the Wyker Meer, with suitable branches, to accommodate Halfweg, Haarlem, and the North Holland Canal. All of the watery space not enclosed is to be drained for agricultural purposes, and the sale of the reclaimed lands will largely provide funds toward the cost of the works.

From Velzen, the canal is being excavated directly west through the sand dunes, to the North Sea, where the Harbor of Refuge is about half completed. This is to be entirely formed by throwing out from the beach, two piers, each 5,000 feet in length, of heavy blocks of concrete, These piers, which approach each other at the sea extremity, enclose 250 acres of secure anchorage, of which area 150 will be dredged to a uniform depth of 26 feet. Half a mile inward from the beach are being finished the extensive sluices, while the intervening distance to the harbor will form a tidal basin, 26 feet deep, and 197 in surface width.

The lock foundations are formed of huge concrete blocks, similar to those employed in the piers, and are finished in Dutch brick and ashlar.

For the piers, the blocks average seven tons in weight, and are manufactured, by a system of Mr. Hutton's, at Velzen. They are transported to the harbor by rail, and transferred from the car to the sea bottom, by an ingenious steam crane, designed by the same gentleman.

Divers are employed to see that each stone is properly bedded, and they give the signals to the crane driver by means of a cord to the boat. The parapet blocks, of from 50 to 60 tons weight, are, of course, moulded *in situ*.

To get a definite idea of this vast work, one must watch the varied labors combined in the construction of this immense undertaking. He must observe the long sand trains puffing their way, from the lower excavations, at the locks, up the heavy grades toward Velzen, there to deposit their loads along the slowly forming dykes of the Wyker Meer, passing, *en route*, the little locomotives on the bank, conveying their trains of trucks, each carrying its heavy concrete block to form a unit in the long piers that stretch their protecting arms far into the stormy waters of the North Sea.

Add to this the steam mixers and transferring cranes at Velzen, the steam dredgers, and the interminable gangs of "navvies" along the canal, and the colossal nature of such an undertaking is far better understood than by the medium of a hasty pen.

Earing's Improvement in Saws.

The object of the present invention is to provide means for smoothing the sides of shingle heading or lumber as such articles are sawed. To this end the saw is supplied with cutting knives and knife sections.

The saw teeth are made thinner than the knife plates. The cutting sections consists of one or more knives which have chisel edges, and there are two knives to a section, with the edges reversed, so that they cut upon each side of the saw kerf as the saw passes through the timber, thus smoothing the sides of the articles manufactured. The upper points of the cutters are slightly below the points of the saw teeth, and the lower points are supported by shoulders. The saw teeth are set or swaged so that their points are a trifle less in thickness than the knife plates, thus giving the teeth clearance, thereby diminishing the friction. The knives and their teeth thus placed will, it is claimed, cut a less kerf than any saw now used of the same thickness of the knife plates, thereby effecting a material saving in lumber. The number of sections depends upon the diameter of the saw.

Mr. William L. Earing, of Oswego, N. Y., is the inventor of this improvement.

Tapioca Paper.

To prepare tapioca paper, says the *Engineer*, which is very useful for copying photographs by artificial light, 200 grammes of tapioca are soaked for two days in an equal weight of water; ten litres of water are added, and afterwards, for every liter of liquid, ten grammes iodide of potassium, thirty grammes chloride of potassium, one gramme bromide of potassium, are dissolved, and the whole boiled for ten minutes, allowed to stand for a day, and decanted and filtered through fine linen. The paper is immersed, twelve or twenty sheets at a time—or can be floated upon it—for fifteen to twenty minutes; it is then hung up to dry in a dark room. If it has assumed a dark color, that is of no consequence, as it disappears in the silver bath. This is to be prepared in the proportion of 1·15, and for every ounce of nitrate of silver, fifty to sixty grains of citric acid in 30 ounces of water. The time of exposure varies from ten seconds to twenty-five minutes, according to the picture to be copied and the actinic force of the light.

TO CLEAN PETROLEUM LAMPS.—Wash the vessel with thin milk of lime, which forms an emulsion with the petroleum, and removes every trace of it, and by washing a second time with milk of lime and a small quantity of chloride of lime, even the smell may be so completely removed as to render the vessel thus cleansed fit for keeping beer in. If the milk of lime be used warm, instead of cold, the operation is rendered much shorter.

A KNOWLEDGE of our weakness creates in us charity for others.

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Cone Winder for Knitting Machines.

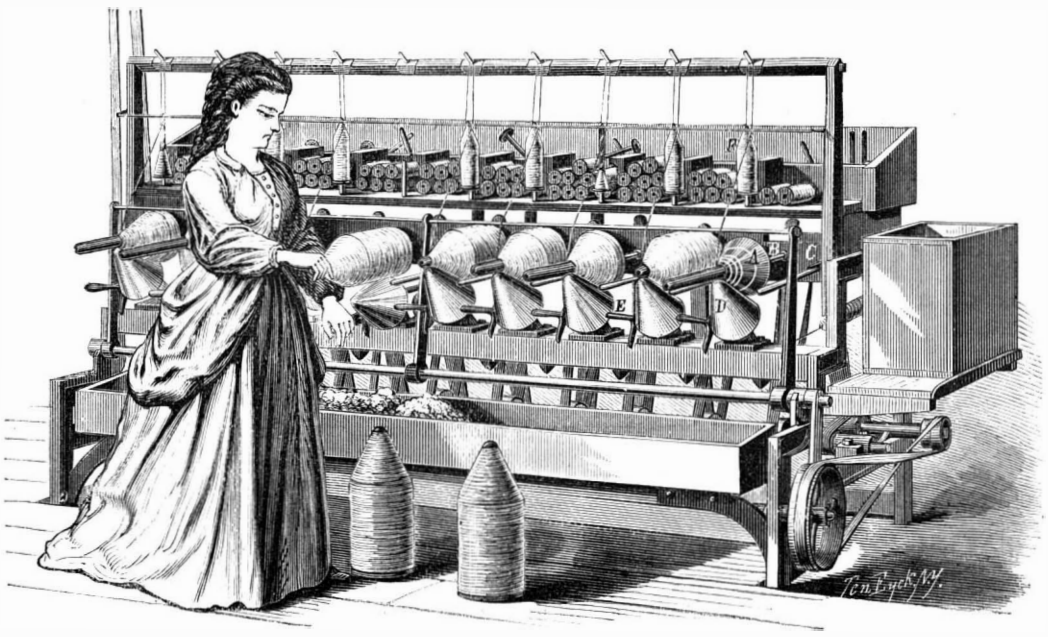
This invention has for its object the rewinding of the yarn as it comes from the spinning jack bobbin or cop preparatory to knitting, and is capable of winding the yarn from one 250 spindle jack. Its simplicity is its great and first noticeable feature, as it works without gearing, and at the same time allows each bobbin to act independently of its neighbor, so that an empty bobbin can be put on between two that are nearly full, or *vice versâ*, and each bobbin is completely formed and filled automatically.

It has long been claimed by experienced knitters, that if a winder could be made to do its work perfectly, at least one half the trouble and labor necessary to produce a good quality of knit cloth would be avoided. This, the inventor claims, is accomplished by this cone winder.

The essence of the improvement consists in so mounting the bobbins relatively to the cones or shell winders, and pressing them thereon by adjustable weights, that any required density may be given to the bobbin.

The bobbins, A, are placed on the horizontal axes, B, which rotate in fixed boxes or bearings in the frame, C. Motion is given to the bobbins by belts from the main drum to splined pulleys—not shown—on the several axes; consequently the pressure of the bobbins against the cones is independent of the tension of the belt.

But at the rear end of each axis, B, there is a weighted lever—not shown—constantly pressing against the axis to hold the bobbin against the cone, and these weights are made adjustable, so that any required pressure can be produced.



TOMPKINS' CONE WINDER FOR KNITTING MACHINES.

The cones or shells, D, are mounted on axes working in pivoted bearings, and are controlled by the levers, E, so that when a bobbin is completed, the cone may be tilted downward out of the way by the operator, as shown in the engraving.

The cops, F, as they come from the jack, are mounted on spindles above the bobbins, and the yarn or thread, as it unwinds from the cop, receives first an adjustable tension, which insures a firm body to the bobbin, and also causes any slack twisted spot to part, so that it can be mended before it is taken to the knitters. From the tension it passes through a variable gage or stripper, which cleans off the seeds, snarls, or unequal sizes of yarn, and from this it runs on to the bobbin, being guided by a quickly moving traversing bar or rod, so crossing and recrossing the thread that it is barely possible for two circles or a double thread to run off while knitting. Each bobbin holds about 22 cops, which will supply a knitting feed for about one hour.

More than one hundred of such machines have gone into use since the issue of the patent. Any further information can be had by addressing the manufacturer, Clark Tompkins, Troy, N. Y.

Body Loop for Carriages.

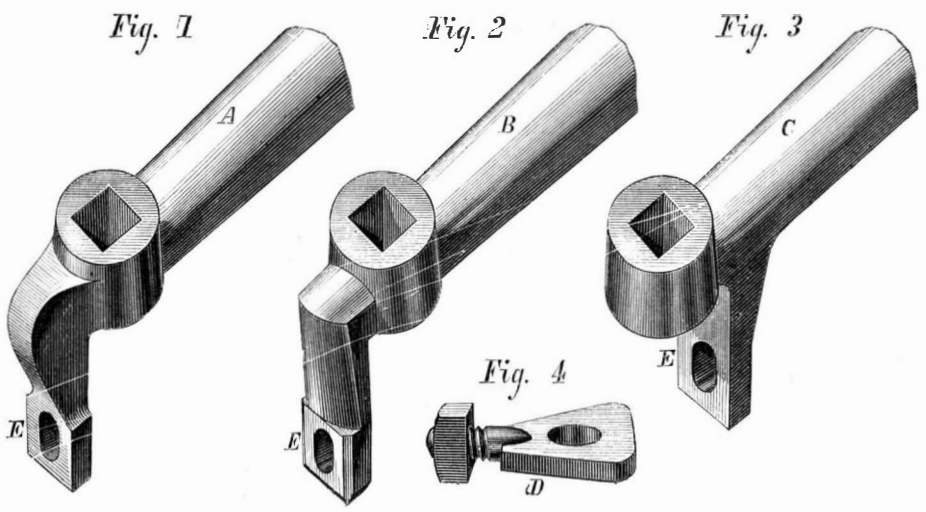
The improvement represented in the annexed engravings overcomes a defect in carriages, which is, we believe, well understood by all who use them.

There is nothing more uncomely in appearance than a carriage, otherwise in good condition, or which could be made so by a fresh coat of paint, with its springs leaning back or forward. This leaning is caused by looseness from wear of the spring bolts, connecting the ends of the springs, or by other causes, the ordinary fastening of the body loops and spring bars being insufficient to retain the parts in their original position.

The angular position of the spring also introduces a different and injurious strain upon portions of the running gear, the weight of the carriage body and its load being then carried beyond the centers of support of the axles.

The body loops represented in Fig. 1, 2, and 3, are of different patterns, Figs. 1 and 2 having a projection or lip in front of the spring bar, and Fig. 3 in the rear of the same. The plate, D represented in Fig. 4, is extended into a bolt which passes through a slotted hole, E, in the lower end of the projection of the body loop, which plate, D, in the operation of securing the body loop and the spring bar together, is capable of adapting itself freely to the bottom surface of the spring bar, and also to follow up whatever compression the wooden spring bar may be subjected to in the act of bolting the parts together; after which the plate, D, is firmly secured to the body loop. In this way each body loop is converted into a brace for the running gear.

This improvement, we are told, has been practically tested on a carriage, which has been in daily use for more than 18 months, and has traveled in that time about 4,000 miles (partly over very hilly ground with "breaks" to turn the water), the load often amounting to from 300 to 400 lbs. weight, the whole running gear being preserved thereby in the same rigid condition as at first. The improvement was patented on October 5, 1871, and is the invention of Mr. H. A. Luttgens, of Paterson, N. J., who may be addressed for further information.



LUTTGEN'S BODY LOOP FOR CARRIAGES.

Improvement in the Manufacture of Picks and Rammers.

This invention, of Mr. Daniel McNally, of Mount Savage, Md., consists in reinforcing the eyes of such tools as are liable to split in the direction of the laminations or grain of the metal, as hereinafter described.

The rammer used upon railroads has more particularly been found to split or break lengthwise. After careful thought and experiment, the inventor claims to have discovered a new method of effecting this object. The opening in the bar iron for the eye of a rammer having been formed in the usual way, he punches one hole a little above and another a little below it, but transversely thereto, and across the grain of the metal. These holes are preferably extended not quite through the blank. He then takes wedges of flat bar iron and places them in these apertures, with the grain at right angles to that of the blank, and welds the two firmly together. The eye is then finished on a mandrel or in any other suitable way, and, if desired, is then chamfered to an elongated edge at top and bottom.

This method of reinforcing the eyes of picks, rammers, and analogous articles by welding a transverse piece of metal above and a like piece below each eye, and with its grain across that of said articles, as described, constitutes the improvement covered by a single broad claim allowed in Mr. McNally's patent.

Machine for Shrinking Hat Bodies.

This invention relates to improvements in machines for shrinking or fitting the bats or thick masses of fiber of which the hat bodies are made. It consists in a grooved roller, mounted in the upper part of a vat above a series of other smaller rollers, for passing the bodies through to subject them to pressure, the said grooved roller being suspended by springs in housings adapted to allow it to rise and fall, and connected by other springs to pressure regulating lines, and the lower rollers having an endless apron working on them and suitable guide rollers to facilitate the carrying of the bodies between them and the upper roller, which said apron may be dispensed with in some cases, the lower rollers being arranged to conduct the bodies to the entering point between the upper and lower ones.

The hat bodies, which are in the form of bats or laps of loose wool fiber laid together on a former much larger than the finished hat, are placed in the hot water in packs between cloth, and passed between the rollers, which it is claimed felt the fibers together and shrink them down to the density and size required much better and with less labor than is done by the common process of shrinking them by hand.

The grooved roller is very effective in working the fibers together on account of the alternate action of the grooves and ribs in pressing upon parts of the surface, while other parts are free, having a tendency to move the fibers on each other much like the action of the ordinary jigger employed for condensing laps into felt cloth.

Peter V. W. Bishop of Morristown, N. J., assignor to himself and Jeptha W. Dunn, of Newark, N. J., is the inventor of this improvement.

Improvement in the Preparation of Mortars and Cements.

Henry Young Darracot Scott, of Ealing, Eng., has just patented, through the Scientific American Patent Agency, improvements in the preparation of mortar, cement, bricks, blocks, artificial stone, and other articles, from quicklime, clay and calcareous shales, for building purposes.

The first part of the invention consists in mixing or dissolving sulphate of lime or other caustic sulphate, in the water used for mixing the ingredients composing the mortar or cement. The water and sulphate are first mixed and quicklime added till a pasty mass is formed, when sand may be used to give it a proper body. The mortar or cement thus obtained is termed "selenitic slip." The following are the proportions of the several ingredients used in preparing the mortar for ordinary building purposes, namely, sulphate of lime, one fifteenth part by measure, to one fiftieth part of quicklime, and four, five, or six parts of coarse sand. Hair, Portland or Roman cement, calcareous shale or marl, puzzolana, sand, shingle, and screened ballast, or water, one or more, are added in proportions to suit the other different purposes for which the cement is designed to be used.

The second part of the invention relates to an improved method of producing a hydraulic cement from quicklime, clay, shales, and other substances. This part of the invention, like the former, is based upon the action of sulphates or sulphuric acid on lime. In making hydraulic cement, the inventor uses of quicklime sixty-seven parts by weight; of fine unctuous clay, thirty parts; and of plaster of Paris, or other cheap and soluble or partially soluble sulphate, such as sulphate of iron, or of sulphuric acid, three parts. Of the lime and sulphate he proceeds, as in the former instance, to make a selenitic slip, and after adding the clay and grinding together the ingredients into a homogeneous mass with about sufficient water to bring the resultant compound into the consistency of stiffish mortar, the mixture is removed from the mill. As only sufficient water has been employed to insure the proper admixture of the ingredients, the mass will shortly begin to set, and will soon become stiff enough to enable it to be made into bricks or balls; or it may be spread on the floor of a drying chamber and dried. It it believed that the quick setting property of the mixture is due to the peculiar action of the sulphate upon the quicklime in the compound. By taking advantage of this rapid setting property, and by making the mixture of the lime and clay in the manner described, the inventor claims that he can produce artificial cements much more speedily and economically than by the present system. The bricks or blocks thus formed are then stacked for drying. They are subsequently burnt in any suitable form of kiln, either as bricks are usually burned, or the lump may be burned as lime is burned. The temperature of the kiln must be so regulated as to bring the silex in the clay into the condition in which it can unite freely with the lime, care being taken that the heat is not too great.

Needles.

There is a needle factory in New Haven where the whole process is done by a single machine, without the manual labor of any person. A coil of steel wire is put in. The machine cuts it off at the required lengths. It cuts the steel pieces consecutively, punches the eye holes, countersinks the eyes, and grinds the points, and, in fact, does everything until the needles drop out completely formed. Another machine picks them up and arranges them heads and points together, and a third piece of mechanism puts them into paper. One of these machines occupies no more space than an ordinary table; each of them turns out from 30,000 to 40,000 per day. Most of the needles hitherto in use have been imported from England until a few years past. They are made there mainly at Redditch, in Worcestershire. The business employs about 4,000 people, chiefly females. The workers are paid from 36 cents for small children to $9·50 for skilled men, weekly.

RAIN and snow storms travel from the west towards the east in the United States, during the months of November December, January, February, and March.

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TOO MUCH GAS; NOT ENOUGH LIGHT.

The various companies who furnish illuminating gas to the citizens of New York appear to think that it is gas that we want, and not light. We have plenty of the former, at any rate we pay for enough, but somehow, in cold weather, the light becomes "small by degrees and beautifully less." If there ever was an absurdity, it is paying for gas by the cubic foot instead of by the volume of light it affords. What we want is light, and that is the article we ought to pay for, and the only correct measure is the photometer, not the gas meter. In every other country but this, there is an inspector appointed whose duty it is to report upon the candle power of the gas furnished by the companies; and, if it is found to be below the prescribed standard, the delinquent company is compelled to pay a heavy fine. In London, the gas inspector is a thoroughly competent man, appointed by the Government, and beyond the reach of the companies. He takes hold of the work fearlessly, and the consequence is that in that city the candle power of the gas is very much higher than with us. Some of the London companies take pride in keeping their gas up to fifteen candles, which is the maximum required of them. It is possible to make a gas of twenty-one candle power, but we could not consume it in an ordinary burner or under the usual pressure; it would be apt to smoke. The more dilute the gas is, the more readily it will pass through any given aperture; hence a gas of a very low specific gravity will rapidly run up a high score on the meter without affording any compensation in the amount of light.

If gas is to be sold by the cubic foot, then the company may pump in a quantity of atmospheric air, or let it consist of fifty per cent hydrogen, or make it of a low grade on purpose. As long as they contract to furnish gas and not light, they are at liberty to speculate as much as they please; the lapse is largely our own for not agreeing with them to give us light, and not gas.

Now that there is every prospect of a reform in many things, we propose that this question be also submitted for discussion. All we want is to have a gas of a fixed and known candle power, to have an inspector appointed to control the manufacture, and heavy penalties attached for any breach of the law; precisely as it is in London, where the whole business has long since been reduced to a system, and frauds have rarely been detected. There are certain circumstances under which the companies ought to have some indulgence shown them, for example: sudden changes in the temperature cannot be anticipated, and they affect the illuminating power of the gas in a very marked ratio.

It has been found that the amount of light emitted at 32° Fahr., is 25 per cent less than at 65° Fahr., and at 4° above zero, it is 70 per cent. less than at 65° Fahr. On the other hand, increased heat is not accompanied by a corresponding amount of light, since the temperature of boiling water causes an increase of 4 per cent over the standard, and that of 320°, only 18 per cent. The loss of illuminating power is due to the condensation of hydrocarbons, which are gaseous at ordinary temperatures, but become solid in the cold. When the companies anticipate a cold snap, they manufacture a richer gas, which will bear this condensation without too great a loss in illuminating power.

The gas companies always have competent chemists, either directly in their employ, or retained for consultation; and they know how to furnish light with gas, instead of gas without light, as soon as it is made their interest to do so. As the law now stands, there would appear to be no remedy but to quietly submit, or take it out in grumbling; in the meantime, it would be well to revive the excellent bill drawn up last winter under the auspices of the Board of Health, and put it on its passage as soon as the Legislature comes together. If that bill did not contain a proviso for the inspection of gas meters, it would be well to have it inserted, as the companies furnish their own meters, and the consumer cannot know that they give correct tally until he is so assured by the authorized inspector. It is a common observation at the present time, that persons who are compelled to work at night soon complain of weak eyes and defective vision.

Many students are disabled and obliged to abandon their studies, while others have substituted kerosene oil for gas. There is no doubt that poor gas has much influence in this increasing infirmity, and this fact affords another argument in favor of a change. According to the *American Gas Light Journal*, more than one hundred million cubic feet of gas are made every month in the city of New York. As the quality of coal used is manifestly very poor, the yield does not probably exceed six or seven thousand cubic feet; but even this inferior coal involves the distillation of about 17,000 tuns a month, or over 200,000 tuns a year. It is probable that, under proper legislation, the companies will be compelled to manufacture a gas practically worth one quarter more than they now furnish to consumers; and, as the annual amount paid to all of the gas companies in New York cannot vary very much from five million dollars, it follows that the community is at least one million dollars short in this transaction. It seems hardly credible that these figures can be correct, and yet they are based on the best information that we can obtain. They are so large that, even with a discount of fifty per cent, they show how imperative is the necessity for reform in a matter in which the whole population is interested. We repeat what we said in the outset, that we have too much gas and not enough light.

PROGRESS OF THE UNDERGROUND RAILWAY SYSTEM.

While the people of New York city have been threatened with the complete disfiguration of their beautiful city by a viaduct railway of unparalleled costliness and repulsive appearance, the inhabitants of Paris are promised a most convenient mode of transit along the main thoroughfares, which will unite all the railway *termini* to one central depot, and also make two connections with the Belt Railway (*Chemin de Fer de Ceinture*). The tunnel or underground system will be adopted in the work.

There is no need to say much more in favor of this mode of construction. The subject has been exhausted in the public journals, as well as by the more convincing arguments of actual experiment on the largest scale, in London, Detroit, Chicago and other cities. The Metropolitan Railway of London affords the best illustration of what is wanted in New York, and points out the most ready and economical means for its achievement.

By making a tunnel along the public highways, the cost of the land and the more expensive item of compensation to occupants is reduced to a minimum. Add to these most important considerations, the fact that the traffic already lies in the very direction your subterranean road will take, and you need say little more to convince the public of the merits of the underground system. The large majority of the opponents of the tunnel railways will be found to consist of real estate speculators, jobbers, men with axes to grind to the detriment of the public grindstone, and the large class of local politicians whose interests lie in the total abnegation of economy and convenience. The proposed railway in Paris, as will be seen in an article on another page, will follow the course of the great thoroughfare of Paris, the Champs Elysées and the Rue de Rivoli. By it, not only will rapid transit from one end of the city to the other be obtainable, but a complete union of all the depots of the main railway lines of France will be accomplished.

There is now some hope for New Yorkers that the viaduct railway, the largest and most hideous job of the almost demolished Ring, will not be constructed. More millions of dollars than we can now reckon will be saved to the people if this imminent calamity can be averted. The Parisian company comes before the public with no other demand than the recognition of the merits of the project, and disdains to ask for pecuniary aid, either from the government, the department, or the city authorities, As all works of such vital social importance should, the Metropolitan Railway of Paris stands solely on its merits as a much needed convenience to the business world, and relies, for a dividend on its capital, on the patronage of the traveling public. And the precedent of London indicates that this is not a chimerical or visionary support to which to trust. The wants of all classes concerned are surely satisfied when a thousand trains a day run in each direction, when people are conveyed four miles in fifteen minutes, with convenient stoppages, for two cents a head, and an average dividend of six per cent is returned to the stock holders.

The citizens of New York have just broken the political power of one of the most powerful combinations against liberty and private rights that ever existed in the world. Surely the same people can throw off such burdens as the viaduct railway, with its monstrous bridges, its destruction of buildings, and its trains running in full view of the horses in the thoroughfares, and substitute a cheap, convenient, and accessible road, made for the use of the public, and trusting to its usefulness and efficiency for a profit to its proprietors.

AN EXACT METHOD OF DETERMINING THE EVAPORATIVE EFFICIENCY OF STEAMBOILERS.

At the late Fair of the American Institute in this city, there were entered for competition the Allen, the Pilegel, the Low, and the Root steam boilers, and a smaller boiler of the Blanchard design.

The Committee of Judges on steam engines and boilers being very desirous of making a trustworthy test, the Board of Managers, with commendable liberality, authorized the considerable expenditure of Institute funds which the proposed method of trial necessitated, and the series of tests has, during the last week, been concluded.

The usual method of testing steam boilers has been simply to determine the quantity of water passing through the boiler and the amount of fuel consumed during a given time, and to state the ratio of these quantities as the evaporative efficiency of the boiler. It is, however, evident that, unless the steam leaves the boiler unmistakably superheated, there is no certainty that a part, and a large proportion, perhaps, of the water may not have been carried over unevaporated, and we know how frequently ignorant or dishonest steam boiler vendors have imposed, upon uninformed purchasers, stories of fourteen, fifteen, or even more pounds of water evaporated by the pound of fuel in their very economical (!) boilers.

With a view to ascertaining accurately the relative performance of the boilers offered for trial, and at the same time giving honest and intelligent builders a weapon with which to meet such competitors as are above referred to, the Committee of Judges, Messrs. Thurston, Sloan, and Weir, caused to be built a large surface condenser of about 1,100 square feet of condensing surface, and with meters attached to measure the amount of condensing water.

The steam was delivered into this condenser from the boiler, where the pressure was, as nearly as possible, seventy-five pounds per square inch.

The trial of each boiler was twelve hours long. Steam was raised with wood to a pressure of seventy-five pounds, when the exhibitor was allowed to use coal and the trial was formally begun. The feed was measured by a meter, the water of condensation was weighed on a carefully adjusted platform scale, and the temperatures of feed, steam, water of condensation, injection and discharge of condensing water, and of the temperature of flues were all carefully recorded by selected students of the Stevens Institute of Technology, under the direction of Professor Thurston, chairman of the committee.

The quantity of heat carried off by the condensing water being known, and the quantity of water of condensation, it becomes an easy matter to determine the quantity of heat transferred to the tank by each pound of the latter, and thus to determine precisely its condition, and if wet, the amount of water brought over unevaporated.

The publication of the report will be anticipated with great interest by engineers. It is only known that the results are quite creditable to the exhibitors, and indicate that persons claiming an economy much superior to about ten pounds evaporated from 212° Fahr. by the pound of combustible may be looked upon by purchasers with great suspicion.

CONCRETE BUILDING.

The recent fire in Chicago has called forth a general discussion on the subject of fireproof building and building in general, and altbough we have said much at different times on the subject of concrete building, the present seems a favorable opportunity for calling our reader's attention again to this important subject.

Slowly but surely, in spite of many failures on the part of experimenters, is the truth becoming established that artificial stone can be made as durable as most natural stones. There have been many humbugs practiced, but these, though they have hindered progress, have not totally checked it. The artificial stones made by the Sorel, Frear, and Ransome processes, and those made with Portland cement, are all good, reliable stones. Of these, however, only the latter can be used *in situ* for concrete walls, and it is of the latter that we propose to speak more particularly in this article.

The erection of concrete buildings, or at least partially concrete buildings, promises, we think, a complete solution of the problem of cheap building for working men. Of all materials we know of, none compares with good Portland cement for this purpose. It has proved its value in extensive works in Europe, where, in addition to the usual effects of weather, it has had to endure the constant action of sea water. It hardens perfectly in a few hours, and forms with sand a concrete rivaling, in hardness and compactness, the best building stones in use. It can, by the addition of coloring matters, be given tints resembling brown sandstone or Nova Scotia stone, while it is far more durable than either. It is much cheaper than bricks and mortar, and can be easily molded in ornamental forms. It possesses far greater strength than ordinary brick work, and looks better when finished. It is as well adapted to inside as outside work, and may be wrought into floors and partitions. It is incombustible and as impervious to water as any stone in use.

With all these advantages, it is steadily making progress against prejudice, and we have not the slightest doubt that it is destined to a far greater popularity in the future than it enjoys at present.

This cement unites readily with sharp clear sand, gravel, broken bricks, pebbles, cinders, etc.; and hydraulic limes may, in some climates, be economically used in connection with it.

To erect buildings of this concrete requires only the skilled labor necessary to place properly the frames, in which

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the concrete is molded, and the frames of doors and windows. For warehouses, it admits of the use of iron for pillars and braces, while everything else, floors, partitions, ceilings, etc., may be of concrete. It is estimated by an expert of this city that 100 cubic feet of Portland cement concrete wall can be constructed for $22·75.

If plastering is used on interior walls, only one coat is required, so that this item of cost is considerably lessened.

For sidewalks this cement also furnishes a cheap and beautiful material, which can be formed in blocks on the spot, presenting a perfectly uniform surface, rivaled only by cut stone.

The rebuilding of Chicago furnishes an admirable field for the employment of concrete; and we trust that, as economy must be perforce consulted, our Western friends will be induced to turn their attention to the system, as it offers advantages possessed, as we believe, by no other.

DR. DRAPER'S EXPERIMENTS WITH BRICK AND STONE.

We desire to call special attention to an article, published in our last, which is followed by a second, in our present issue, from the pen of Dr. John C. Draper, on the absorption of moisture by brick and stone. His experiments will show that bricks, properly compounded and burned, are really superior to many kinds of natural stone for building purposes.

A brick is an artificial stone, homogeneous and without cleavage. It may be made so as to absorb less moisture than many varieties of stone in popular use.

The experiments conducted by Dr. Draper were made with brown stone, Nova Scotia stone, fine red Philadelphia bricks, and a white, or rather cream colored, brick, made by A. Hall & Sons, of Perth Amboy, N. J. A specimen of the latter now lies on our table, and is undoubtedly one of the best building bricks ever produced in this country.

In color it is soft, yet brilliant, its tint being very agreeable to the eye. In texture it is dense and hard, ringing with a clear bell-like sound when struck, and chipping more like dense, hard stone than like the ordinary bricks in market. With granite or blue stone trimmings, these bricks would produce a beautiful architectural effect for fronts, in our opinion far superior to the somber appearance of the brown stone, now so much in vogue, and which is undoubtedly one of the least durable of building stones in use.

Even ordinary bricks will endure our climate better than brown stone, as will appear upon an examination of buildings constructed of bricks with brown stone fronts. In such buildings, that have been erected for a considerable time, it will be found that the fronts are the first parts to become dilapidated, the surface becoming disintegrated and peeling off.

Nova Scotia stone is, perhaps, not much better, in this respect, than brown stone.

The senior member of the firm of Hall & Sons has, perhaps, as extensive theoretical and practical knowledge of brickmaking as any one in the country, and this journal has been enriched by his contributions upon this important subject. The result of the application of this knowledge, and the use of a very excellent article of clay, has enabled his firm to produce the bricks alluded to.

In conclusion, we would say that any who have any doubt as to the superiority of brick over the brown stone and Nova Scotia stone, as building material, will do well to peruse Dr. Draper's articles with attention.

THE STUDY OF SCIENCE IN SCHOOLS.

There is not an inventor or mechanic who does not suffer for want of a good elementary training in mathematics and the sciences; and yet, notwithstanding this notorious fact, it seems impossible to introduce such a reform in our school education as will successfully remedy the evil. The chief difficulty in the way of reform is in the supply of teachers. Our training schools have raised up teachers whose minds run in the same groove, and who have no mental switch by which they can turn off on to a new track. The custom of learning everything by rote, and reciting like a parrot, has become so embedded in our system of education, that it seems almost impossible to find any explosive sufficiently active to blow it up, and no jack screw or hydraulic ram is powerful enough to move our Boards of Education from their firm foundations. But as the continued dropping of water may wear away a stone, we propose to keep adding here a little and there a little, until some impression has been made and some good has been accomplished. It is probable that we must look to the West for our chief support in the war that it is proposed to wage against the relics of monastic education. They have a practical way of viewing things in that section of the country, and common sense is allowed to have due weight in questions of all kinds. We are, therefore, not at all astonished to learn that, at the University of Iowa, instead of teaching physics, chemistry, geology, and astronomy, by oral recitations and unillustrated lectures, they have established laboratories and workshops, where practical things can be practically learned, and theoretical ones can have all of the weight that properly belongs to them. The trustees of the Iowa State University have resolved that the only way in which instruction in science can become thorough is by placing the elements of physical science *at the very beginning of the course.* They do not propose to wait until the pupil, by droning over dry facts and abstract principles, has acquired a disgust for every branch of knowledge, but they think it wiser to pursue the natural method, and begin when the mind is anxiously inquiring into the cause of things, and the boy takes his watch apart to see what makes it go. The old-fashioned way was to give the boy a sound flogging, to take the watch away, and make him learn by rote the principle of compensating balance wheels.

"My dear boy," says the teacher, "the duration of an oscillation depends on the radius of the wheel, the mass of its rim, and the strength of the spring," which, of course, is very intelligible to the lad, and would enable him at once to construct a new watch.

Common sense would dictate the propriety of showing up the parts of the watch, and by degrees expounding the principles upon which the construction is based. Theory and practice is what we want, and not either of them alone. Technical instruction alone will not result in the advancement of science, but that, together with a thorough training in the phenomena of Nature, will lead to great progress.

For the purpose of aiding in the introduction of experimental science in our schools, Professor Gustavus Hinrichs, of Iowa, has published "The Elements of Physical Science," and "The School Laboratory of Physical Science," books which are intended to serve as guides to teachers and pupils.

The author says that, under his system, the result is "a marvel of studious industry." The students enjoy measuring, weighing, testing, demonstrating, and recording facts which, in former times, were pored over in a maze of bewilderment in the driest text books, to be afterwards bolted in sections without question. He proposes that the course shall be divided into three parts, rudiments, elements, and general principles—all of which should be completed in the high school course, and be conducted with facilities as good as have so long been afforded in other departments. By securing in this way a sound elementary training, two very important advantages are gained: First, if, as often happens, the boy is unable to pursue his studies beyond the high school, he will not be compelled to grope about in utter darkness in his subsequent career, but will be so far grounded in principle and practice as to be able to avoid the errors which now pervade society, and give aid and comfort to believers in perpetual motions and mysterious agencies. Second, the advantages, to those who have the means of pursuing their studies beyond the confines of the high school, will be very great. Having surmounted the elements of knowledge, they are in condition to prosecute their studies to a higher point than was hitherto possible, and the advantages to themselves and to society would be very great.

In the first part of his book, Professor Hinrichs takes the pupil through a course of simple and easy experiments relating to magnitude, weight, machines, properties of matter, light, electricity, and magnetism. The metrical system is taught by means of actual measurements performed by the scholars themselves, and the pupil constructs his own measures of weight and length, makes numerous determinations, and puts down results in his journal. There are blank pages at the end of the volume for independent observations and experiments.

This strikes us as the only sensible way in which to impart instruction in science, and after it has been practiced for one generation, the condition of society will be found to be vastly improved. The best interests of education demand that we should begin at the bottom of the ladder and not at the top. The top can take care of itself, but if the foundation be weak and rotten, the bottom and the top will topple down to a common ruin.

[Special Correspondence of the Scientific American.]

A NUMBER OF EXTENSIONS.--TEDIOUS SEWING MACHINE CASE.

WASHINGTON, D. C., Nov. 18, 1871.

Among the extensions recently granted is the patent to J. W. White for a cotton seed planter. It consists of a frame with a seed wheel mounted within, a furrow opener attached to the forward part of the frame, and an adjustible seed coverer suspended from the rear. It is said to save fifty per cent in labor, and do much better work than hand labor. The civil war prevented the patentee from securing a suitable reward for his invention.

Also the patent of George S. Butterfield is extended. It is a grinding and polishing machine, designed especially to improve the manufacture of knives for planing machines, in which a perfectly plane and true surface is a great *desideratum*, the grinding by hand being very defective in this respect, as well as laborious. The result is secured by causing the article to be ground to reciprocate, vertically and horizontally, in a plan tangential to the face of the grinder. The mechanism for giving the vertical movement is very ingenious and elaborate. This particular compound movement, however, was not new, the same having been provided for in a patent issued to William Harvey as early as 1847, and in other patents antecedent to Butterfield's. The invention reduces the cost of the knives at least ten per cent. The machine is a valuable one and substantial profits have already been realized.

Also an extension is granted to E. H. Smith for a sewing machine shuttle. The invention is pronounced by the Examiner to be a very meritorious one, and as yet not suitably rewarded.

Willard & Ross' improvement on harvesters. This patent was reissued in 1864, in seven divisions, and in four of these, extensions have been granted. The patent is an improvement on what is known as the Ball machine or Ohio Mower. In that machine the double hinged coupling arm is used, giving a flexible connection to the finger bar, and rendering it capable of freely conforming to an uneven surface. The improvement consists in projecting the inner end of the finger bar beyond the lower joint, to form a knuckle, and in pivoting to the coupling arm a lever to act in connection with it, by which the lower joint is made rigid; so that, when the heel of the finger bar is raised to pass obstructions, the outer end can be lifted also. This locking and lifting device constitutes the leading feature of the invention, and in the original patent there were but two claims, though the reissues embrace fourteen claims. The devices are simple but useful.

John Griffin's pile for wrought iron beams and girders. This improved pile closely resembles, on a cross section, a finished beam, and the rolling is therefore effected without any great reduction of its different parts, and consequently without any very unequal tensions of the fiber of the metal. In the case of other piles, the tension during the process of rolling is so unequal as, more or less, to tear the metal and separate the flanges from the web, thereby checking the edges of the flanges. Griffin's pile has thus far been used exclusively by the Phœnix Iron Company, of Phœnixville, Pa., and by Palmer & Co., at Buffalo, N. Y.; and these companies have manufactured more than two thirds of the beams and girders made in this country since the patent was issued, amounting to 37,758 tons. The advantages arising from the invention are, first: that cheaper iron may be used. Second: lighter and cheaper machinery may be used in rolling it. Third: the beams are much superior to those made of the ordinary rectangular pile. Fourth: larger beams can be rolled, the size being limited only by the size of the roll trains and the capacity of the furnace. The royalties to the patentee have already amounted to a large sum, but in consideration of the value of the invention, the Office does not consider that he has been suitably rewarded. To the public, the saving has been from one to one and a half cents per pound, amounting already to the sum of $700,000. The use of wrought iron beams in public and private buildings has greatly increased of late years, and in 1857 the manufacture was exceedingly limited. Since 1861, the Government has procured from the companies referred to, not less than 4,000 tons of fifteen inch *chassis* rails, for fortification ordnance; and the saving arising from this invention is not less than $120,000. It is patented in England, France, and Belgium.

William Pratt, for an improvement in safety lamps. This is a protection against the explosion of vessels containing a volatile inflammable liquid; and consists of a volute of ribbed metal wound together, forming a series of regular tubes, inserted in the main orifice. The parts are so arranged that the wick cap cannot be removed until the cap of the feeder tube has been removed. The invention does not appear to have gone into general use, but it is claimed to be one of great utility.

William Sellers' improved machine for threading bolts the object being to avoid the necessity of reversing the motion of the cutting dies or stopping the machine to change the bolts, and to facilitate the change of the dies. It is claimed that the machine does twice the work of an ordinary machine. If the 402 machines, manufactured and sold, had been in constant use during the fourteen years since the patent was granted, it is calculated, and the estimate is supported by practical machinist, so that the saving to the public would have amounted to the sum of $1,081,500. The profits to all the parties interested are estimated at about $50,000.

W. H. Nettleton's machine for turning pillars for clock movements. Nearly all the clock pillars made in the country are manufactured on this machine. In the town of Bristol, Conn., there are nine clock making companies; and one of these manufactured last year 40,000 clocks.

Pierpont Seymour's machine for spreading lime and other fertilizers. The invention is a mechanism for operating a hopper with an inclined bottom provided with reciprocating bars.

Richard M. Hoe's printing apparatus consists in locating the cam shafts for driving the fly frames close up to the frames, greatly reducing the jar and wear of those parts. A simple invention, but one which saves annually, to each press on which it is used, the sum of $150. Patented in England.

Alexander S. Newton's machine for turning wooden boxes. An arrangement of devices by which round wooden boxes can be made from a square stick, thereby saving the expense of rounding the timber before it is placed in the lathe.

The following applicants have been refused:

Nicholas Whitehill, for a cultivator. The machine is a straddle row cultivator, the middle being elevated to pass over the row of corn, and provided with a compound evener suspended on three points. Remonstrants claimed that the patent was anticipated by the patent to Stahl and Hiffenbacher, as early as 1835, and also by five other patents of later date.

W. N. Clark, for an elastic door guard, being a rubber buffer, confined by an escutcheon ring, to receive the force of the door knob and protect the wall. In this case, the original application as well as the application for re-issue was refused by the Examiner, but finally allowed on appeal. The Commissioner decides that "applicant has monopolized more than his invention in his re-issue, and is not entitled to further monopoly of even what he did invent."

It is not uncommon in the regular routine of the Patent Office for an application to become somewhat snarled and tangled, and generally off the track. In January, 1869, William Duchemin, of Boston, applied for a patent for an improved sewing machine for manufacturing shoes, and its history in brief is this: February, 1869, letter from office rejecting some claims, showing needed corrections in specifications, and calling for an additional drawing. May, 1869, applicant informed that a certain clause of his claim must be limited if he wishes to avoid an interference with a subsequent application. May 20, 1869, interference declared. June 9, 1869, interference dissolved. New interference declared between applicant and three other applicants. September, 1866, decision in favor of Duchemin. Case appealed to Examiners-in-Chief, who, in January, 1870, decided against

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Duchemin. Case appealed to Commissioner, who, in April, 1870, sustains the action of the Board. Then appealed to Supreme Court of the District, and decision in favor of Duchemin, July 7, 1870. On return of case to the Office, in May, 1871, the correspondence was opened, which resulted, in June, 1871, in still another declaration of interference, in this case with a patent, which interference was dissolved in August, but followed in a few days by a fourth interference. The above leading actions were interspered with sundry correspondence and conferences too numerous to mention; and finally the points at issue were so adjusted that the case was passed on the 6th instant, and appears in the regular issue of the 28th.

SCIENTIFIC INTELLIGENCE.

CHEAP PREPARATION OF CHLORINE.

Tessié du Motay, whose name is identified with the cheap production of oxygen and hydrogen, has invented a new process, for making chlorine, that seems worthy of notice. He first prepares chloride of manganese in the usual way, and decomposes this by heating it, in contact with steam and air, in earthen retorts, whereby chlorine and hydrochloric acid are evolved. If oxygen or air is passed over the red hot chloride of manganese, chlorine is given off and peroxide of manganese reproduced. If over this material a mixture of hydrochloric acid gas and air or oxygen is passed, chlorine is continuously produced and peroxide of manganese regenerated. The method appears to possess advantages over the mixture of common salt, manganese and sulphuric acid, or of manganese and hydrochloric acid, formerly employed, as it is continuous; and, after the first outlay for materials, the chief running expense would be the fuel, as the hydrochloric acid required for decomposition would cost very little.

DEPOSITING ALUMINUM ON METALS.

J. Baynes Thompson, of White Hall, England, writes to the editor of the *Chemical News* that for more than two years he has been depositing aluminum daily on iron, steel, and other metals, and driving it into their surfaces at a heat of about 500° Fahr., in the same way as he does silver and nickel. He also says that he can do the same thing with aluminum bronze, of various tints from the palest lemon to the richest gold color. Some years ago, Dr. Gore, of Birmingham, England, also claimed to be able to coat copper, brass, and German silver with aluminum by means of electrolysis. As there is no reason to doubt the veracity of either of these gentlemen, it would appear to be a fact that aluminum can be deposited by electro-galvanic action the same as nickel, copper, and other metals. We should be glad to be furnished with the details of the process.

KLINKERFUES' PATENT GAS LIGHTER.

On page 393, Vol. XXIV., we gave a full description of Dr. Klinkerfues' ingenious contrivance for simultaneously lighting the street lamps of a large city. We learn from the German *Journal für Gasbeleuchtung* that the inventor proposes some important modifications in the apparatus. Instead of having a separate tube for regulating the pressure, he proposes to use the ordinary pressure of the gas mains. There are three conditions required: In the first, the apparatus must be out of function and the gas tube closed; in the second, the plates of the battery must touch the exciting liquid and the gas tube open ready for ignition; in the third, the plates must be raised out of the liquid, but the tube must be open for the supply of gas to the burner. The first condition can be attained for each lamp by regulating the apparatus according to the pressure of the day time; the second is put at the evening pressure, with the addition of a few tenths of an inch so as to assure the lighting of all the lamps. The excess of pressure can then be removed and the lamps will continue to burn until, by reversing the process, the day pressure is reached and the supply of gas again cut off. The parts of the apparatus remain the same as heretofore described.

RED, GREEN AND BLUE FIRE.

In pyrotechny it often happens that colored fires produce disagreeable fumes or burn too slowly. In order to surmount these difficulties, a German chemist, J. R. Braunschweiger, has been making some experiments, and, as the result of his labors, gives the following recipes:

Red fire, 9 parts nitrate of strontia; 3 parts shellac; 1½ parts chlorate of potash.

Green fire, 9 parts nitrate of baryta; 3 parts shellac; 1½ parts chlorate of potash.

Blue fire, 8 parts ammonium sulphate of copper; 6 parts chlorate of potash; 1 part shellac.

It is only necessary to reduce the shellac to a coarse powder. The nitrate of strontia, baryta, and the ammonia salt ought to be intimately incorporated with the shellac before adding the chlorate of potash; and, as any hard rubbing or percussion of the latter salt in a mortar might occasion an explosion, it is better to mix by transferring from one sheet of paper to another, and not attempt to rub the mixture at all. By the above mixture, the suffocating odor of sulphurous acid is avoided, and the fireworks can be let off without inconvenience in any large room. To obviate the danger of spontaneous combustion, the chlorate of potash could be stored in a separate bottle and mixed when wanted, in the way described.

NITRIC ACID IN WELL WATER.

A. Wagner has determined the amount of nitric acid in a large number of wells in the city of Munich, and finds, for the water obtained directly, an average per liter of 0·1555 grammes nitric acid, equal to 0·2908 grammes saltpeter; and for water introduced by pipes, 0·0249 grammes nitric acid, equal to 0·0485 grammes saltpeter. As 14 milliard liters of water are annually consumed in Munich, if it were all drawn from the wells it would yield 4,071,200 kilogrammes of saltpeter. The author thinks that enough saltpeter is annually consumed in the drinking water of Munich to make 5,500,000 pounds of gunpowder. What the effect of this enormous consumption of saltpeter may be upon the health of the inhabitants is not stated by the author.

PRESERVATION OF MEAT.

At the meeting of the Lyceum of Natural History on Monday evening, Dr. H. Endemann read a paper on this important subject, in which he gave an account of a process invented by himself. About 100 pounds of meat are placed in a suitable chimney, and air, heated to 140° Fahr., is drawn by an exhauster through it until it is entirely dry.

Great care is observed, by the introduction of thermometers in different places, that the heat does not get above 140°, as in that case the albumen and fibrin might be coagulated and much more difficulty encountered in expelling all of the water. The air is filtered through cotton before being passed through coils of steam pipe for heating. The meat is subsequently ground into powder, and will keep in ordinary paper packages It can also be compressed into hard cakes, for diminution of bulk. Four to five ounces of the dry powder represents one pound of meat. Scattered upon bread, its flavor is excellent and preferable to that of raw meat. It has an agreeable aromatic odor; and, as all of the albumen and fibrin are present, all of the nutritious properties of the flesh are retained, which cannot be said of Liebig's extract where these important constituants are wanting. It was stated that the expense of drying need not exceed one cent a pound. Any method by which we can reduce the price of beef must be looked upon with favor; and it is to be hoped that the plan proposed by Dr. Endemann may prove successful.

PRINCE ALEXIS--HIS WELCOME TO AMERICA.

Full accounts of the brilliant reception of Prince Alexis have appeared in the dailies. The reception was admirably arranged, and the unmistakable cordiality and warmth of his greeting must have been highly flattering to the youthful scion of royalty.

The prince is the third son of the Emperor Alexander II, and was born January 14, 1850. He bears the name of Alexis Alexandrovitch, or Alexis the son of Alexander. He is a Grand Duke, and Chief of the Infantry regiment of Ekatherinenbourg and of the first division of the Finland fleet. The Prince Alexis has received a good German education, as well as a thorough training in military and naval tactics. He is reported as in favor of liberal principles, and as opposed to the reactionary policy of the Old Russian party, of which his elder brother, the Cesarevitch Alexander, is at the head.

All unite in praise of his fine manly bearing. His stature is above the average of what are usually called large men. He is six feet two inches in hight, and broad in proportion. His look is commanding, and he seems possessed of a fine, cultivated mind. Followed everywhere by good wishes, we trust his visit to the United States will prove one of the happiest events of his life.

NEW BOOKS AND PUBLICATIONS.

ENGINEER'S POCKET BOOK. A Pocket Book of Useful Formulæ and Memoranda for Civil and Mechanical Engineers. By G. L. Molesworth, Member of the Institution of Civil Engineers. Seventeenth Edition. Royal 32mo; roan. Post Free, $2. E. & F. N. Spon, London, and 446 Broome Street, New York.

This invaluable pocket book for the engineer is just published in this country, and is a new and improved edition, containing 150 pages additional matter—450 in all. This, the *seventeenth* London edition, has been rewritten and thoroughly revised, the past year, by its author, bringing into its pages the results of the latest experiments and advances in engineering science. It is one of the most complete, correct, and reliable collections of Civil and Mechanical Engineering Formulæ and Memoranda extant. The sale in England alone has reached 40,000 copies, with an increasing demand; and we recommend it to the attention of our engineers and inventors as a profitable investment.

Examples for the Ladies.

Mrs. Mary O. Lewis, of Tremont, Westchester County, N.Y., reports her personal earnings, by stitching only, with a Wheeler & Wilson Machine, as follows: Earned in 29 months, $7890; average per month, $269; per day $10.76; earned in one day of 18 hours, $30: earned in one month, $350, an average per day of $14; earned in 12 months, $3745, averaging per day $12.50. She has used the sewing machine 17 years, and is now, and was during that time, in robust health.

Dandruff can be removed by the use of Burnett's Cocoaine; also Irritation of the scalp.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Workingman's National Illustrated Paper—the "People's Monthly" of Pittsburgh. Pure, live, cheery and wholesome. Teems with cuts and practical information. Try it for the new year. Only $1.50.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

An Incubator wanted. G. L. Wing, Somerset Mills, Me.

For Sale—A First Class Engine, 40 Horse Power, two years in use. To be seen working at 102 Attorney Street, New York.

A Traveler of experience and reputation could sell specialties in Crockery, Cutlery, Silver and Glass Ware, Lamps, Gas Fixtures, House Furnishing, &c., on commission, from Jan. 1st, to the Jobbing trade only. Address Lock Box 123, Pittsburgh, Pa.

Wanted—Straw Paper Machinery. N. P. Mix, Columbus, O.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Hand Saw Manufacturing at the West is comparatively a new industry. Western dealers and consumers are referred to the advertisement of Woodrough & McParlin, on another page.

The best Engine Lathe and Planer Makers, please send circulars and price list to G. P. Capewell, Cheshire, Conn.

N. H. Taylor, Engraver on Wood, re-established at 30 W. Madison Street, Chicago.

Patent Iron Rim Moulders Riddles and Sieves. Send for Circular. Horton & Mabie, Peekskill, N.Y.

3 Hydraulic Presses for sale on reasonable terms. Apply to Whitneyville Armory, Conn.

Wanted a set of second hand Stamps, complete, such as used for stamping ores. Address Box 4600, New York Post Office.

Cutting and Stamping Presses, Lathes, Small Engines, other Machinery, small lathe Castings. Address Jno. Dane, Jr., 93 Liberty st. N.Y.

Metallic Molding Letters, for Pattern Makers to put on patterns of Castings, all sizes, etc. H. W. Knight, Seneca Falls, N.Y.

The Pew Hat Rack. State and County Rights. E. S. Blake, Pittsburgh, Pa.

The best wood filler in use, 25 cents per lb. Made, used, and sent (in packages of not less than 16 lbs.) all over the country, C. O. D., by L. W. Jones, Unionville, Conn.

The best and cheapest Self Oilers are manufactured by Holland & Cody, 8 Gold Street, New York. Send for price list.

Land sufficient for the purposes of any good manufacturing business, and most admirably located on the Poughkeepsie & Eastern R. R., with plenty of water for steam purposes at hand, and only fifteen minutes' walk from the center of the city, will be given to any parties who who meet the views of the owner. Address P. O. Box 534, Po'keepsie, N.Y.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubribating Oil, 75 cts. Send for certificates. 116 Maiden Lane, N.Y.

Use Soluble Glass for fireproofing Wooden Pavements, Shanties, R. R. Bridges—also as common hardening Mortar and Cements, makes most durable Stove and Foundry Putty, Iron Cement. Apply to L. & J. W. Feuchtwanger, Chemists, 55 Cedar street, New York.

One "Scott's Wheel Moulding Machine," saves $5,000 yearly in patterns—wheels absolutely perfect. Engraving sent free. Hamilton E. Towle, 176 Broadway, New York.

Portable Farm Engines, new and beautiful design, mounted on Springs. Compact, light, and efficient. Send for descriptive circular, Mansfield Machine Works, Mansfield, Ohio.

For the best 15 inch Eng. Lathes, Bench Lathes, or Friction Pulleys, address John R. Abbe, P. O. Box. 345, Providence, R. I.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N.Y

Stencil Tools & Steel Letters. J.C.Hilton, 66 W. Lake st. Chicago.

To Boiler Makers—Water Gauges sold cheaper by us than any other House in the Country. Holland & Cody, No. 8 Gold st., N.Y.

Baxter's Adjustable Wrenches fit peculiar corners where no other will work. All first class mechanics need one. Baxter Wrench Co., 18 Park Place, New York.

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Shoe Peg Machinery. Address A. Gauntt, Chagrin Fall, Ohio.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 107 Girard ave., Philadelphia, Pa.

Builder's Scaffold—Patent for Sale—For further particulars, address Redick & Kunkle, Butler, O.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Walrus Leather, for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane

Turkey Boxwood pieces for Sale, suitable for engravers and fancy turners' use. Address Stephens & Co., Riverton, Conn.

All kinds of Presses and Dies. Bliss & Williams, successor to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

The best lubricating oil in the world is Winter pressed Sperm. Sold in bottles, cans, and barrels, by Wm. F. Nye, New Bedford, Mass.

Best Oak Tanned Leather and Vulcanized Rubber Belting Greene, Tweed & Co., 18 Park Place, New York.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D.Andrews & Bro, 414 Water st., N.Y

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Blake's Belt Studs. The cheapest and best fastening for Rubber and Leather Belting. Greene, Tweed & Co., 18 Park Place, N.Y.

For Best Galvanized Iron Cornice Machines in the United States, for both straight and circular work, address Calvin Carr & Co., 26 Merwin St., Cleveland, Ohio.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

Power Punching and Shearing Machines. For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

Peck's Patent Drop Press. For circulars address the sole manufacturers. Milo, Peck & Co., New Haven. Ct.

Francis Schleicher, Consulting, Analytical and Man'fg Chemist. Laboratory, Newark St., bet. Jackson and Harrison St., Box 172, Hoboken.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year

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Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

S. F. M., of Ill.—You can make a magic lantern with two fine sets of photographic portrait lenses that will give good sized images.

R. L. K., of ——.—You should be able to get such a spring as you require made in any good machine shop.

W. H. B., of Va.—Your suggestion in regard to tramways is not new.

J. E. B., of O.—The metallic specimen you sent is pure galena, a valuable ore of lead. The other two are barytes, extensively used for white paint.

PURIFYING KEROSENE OIL.—N. L. & Co. can recover kerosene, after using it to remove whale oil and grease, by distillation at a low temperature—say 130° to 150° Fahr. Probably the contaminated kerosene, if in considerable quantity, can be sold to the refiners.—H. G. F., of Va.

CONDENSATION ON WINDOWS.—Let J. E. G. double the glass in his show window, leaving a space of one fourth of an inch between each pair of lights. If he wishes to test the above, he can try it on one light or section of his window.—C. H. B.

DISCOLORATION OF BRICKS BY SMOKE.—Whitewash with sifted wood ashes; a double handful to the pailful will do the thing nicely. The ashes form a lye that acts upon the soot. A coloring matter can be added if desirable, or the wall might be gone over by a man whose trade is called tucking.—C. H. B.

WEAR OF SLIDE VALVES.—If a valve's diameter is five inches and it moves two inches, there is a space of three inches in the center, say over the ports, always covered, and of course always under wear; while there is one inch, at either end of the stroke, that is under wear just half the time. If W. C. would overcome this, he must adopt a cylindrical oscillating valve, which, properly constructed, wears tight.—R. H. A., of ——.

PUMPING WATER A LONG DISTANCE.—I would inform M. H. P., through your columns, that he can pump water the distance and rise he speaks of, and even further. I can show him a pump that draws the water 280 feet horizontally and 27 feet perpendicularly. It has been in use four or five years, pumping water for a farm yard, and has had no repairs until this season.—E. A. P., of Vt.

CEMENT FOR AMBER.—J. R. (query 13, November 18) can cement or mend amber by smearing the surface of the pieces with linseed or boiled oil, and then strongly pressing them together, at the same time holding them over a charcoal fire or heating them in any other way in which they will not be exposed to injury.—C. E. B., of N. Y.

CANKER IN MOUTH.—I would say, in reply to F. S. C., let him take one ounce of muriated tincture of iron, and add four ounces of water, and rinse his mouth frequently with it. He will have no more canker.—G. H. J., of N. H.

CANKER IN MOUTH.—In answer to query No. 7, November 18, I would say to F. S. C. that local application will afford but temporary relief in cases of obstinate sore mouth. If his trouble has been caused by the excessive use of bad chewing tobacco, or by the adhesion of tartar on his teeth, let him remove the cause, and then gargle with a strong solution of white copperas (sulphate of zinc), using great care not to swallow any of the gargle, as it is a violent poison when taken into the stomach.—A. B.

CANKER IN MOUTH.—If F. C. S. will follow this advice (and I suppose he will not) he will doubtless get rid of the canker, if he means, by that, sore spots about the tongue and mouth. These ulcers, simply symptoms of irritation of the stomach, cannot be cured but by removing the cause. Keep yourself a little hungry, eat no swine's flesh, keep your bowels persistently free by opening diet, do not drink whisky, and you will soon rejoice in a sound mucous membrane.—R. H. A., of ——.

AMALGAMATING ZINCS FOR BATTERY.—Lay the zincs upon some flat surface or an earthenware plate, and wet them with diluted sulpuric acid, say acid one part to water twelve parts. Then pour on some mercury and rub it on with the finger. If the mercury rolls up in little round balls, add a few more drops of the acid solution. If S. H. intends to use the solution of sulphuric acid for his exciting fluid, the above will be the proportions of water to acid.—J. F. of Ga.

WORKS ON METALLURGY.—S. H. will find the "Manual of Electrometallurgy," by Napier, and "Elements of Electrometallurgy," by Smee, probably the best works on the above subject. The first named volume contains all he will require to know.—J. F., of Ga.

COLORING GOLD.—To obtain the red color of fourteen carat gold in plating, prepare a solution of cyanide of gold and cyanide of copper, add the cyanide of copper to the gold solution, until the desired color is obtained. Mode of application: use gold of the desired color. The cyanide of copper is prepared by adding cyanide of potassium to a solution of sulphate of copper until the precipitate at first thrown down is redissolved.—J. S. G. S.

MATERIALS FOR FILTER.—R. B. M. wishes to know the best form of filter. I know of nothing better than soft bricks. They will necessarily be put in the form of a partition, laid in cement, so that the water cannot get between them, and allowing the water to pass through the thin way of the brick. This may color the water a little the first time the filter is filled, but after being pumped out, it will be perfectly clear the next time, if the shingles do not color it.—S., of Mass.

BLACK COLOR ON BRASS WORK.—I take pleasure in complying with C. D.'s request. Make a strong solution of nitrate of silver in one dish and of nitrate of copper in another. Mix the two together, and plunge in the brass. Now heat the brass evenly till the required degree of dead blackness is obtained. This is the method of producing the beautiful dead black, so much admired in optical instruments, and which was so long kept a secret by the French.—L. S.

CASE HARDENING.—In answer to E. N, G., I would say that I have used two kinds of case hardening to good advantage. These two kinds I will term the quick and slow processes. The first is done by heating the article you wish to harden to a red heat, and rolling it in or sprinkling it with prussiate of potash; then return it to the fire and heat to a light red, then plunge it in water. The next or slow method is done by burning scraps of leather to coal and pounding fine; then putting the ash in a sheet iron box in layers with the article which is to be hardened. Begin and end with the coal; place the box and contents in a sharp fire for an hour or an hour and a half; then dump the contents of the box into water. This hardening is used by many gunsmiths to produce the colors often seen on iron gun mountings. It may be polished, if desired.—J. H. H., of Mich.

AMALGAMATION OF ZINC PLATES.—Let S. H. immerse his zinc in sulphuric acid diluted by water to about two thirds its former strength, and let it remain until the dirt is removed, and then immerse in mercury. If the amalgamation is not perfect or nearly so, repeat the process; but if it is not perfect, it will make no] pereeptible difference in the or in of the battery.—G. A. F.

BLACK FINISH ON BRASS INSTRUMENTS.—In answer to query in SCIENTIFIC AMERICAN of November 18th for process of blacking brass work, as done on optical instruments, let C. D. procure a spirit lamp or gas jet with large flame and a brass plate, also some nitric acid (not too strong, but strong enough to fume briskly) in which let him dissolve silver and copper in the proportion of a piece of each about the size of a grain of wheat to a quart of acid. If he has much work to blacken, he should have enough acid to dip his work into, after which it should be allowed to drain a minute. It will then be of a rough green color. Then, having the brass plate heating over the lamp, let him lay the article on it; if the plate be hot enough, his work will turn of a dingy, rough, scaly looking black in about fifteen minutes. Then let him take it off and let it get cold. Lastly, rub the surface and polish with a little olive or other oil and a piece of soft leather. If only a few articles are to be blacked, use less acid, and rub it on with a cloth tied on the end of a stick.—D. L. B., of Pa.

HEATING SMALL STEEL ARTICLES.—Let P. L. S. place a black lead or common cast iron crucible (capable of containing two or four quarts) filled with lead, on a fire made of charcoal. The crucible should rest upon bars of iron just above the blast. Place a wall of brick around the crucible, leaving sufficient space between the wall and crucible (say six or eight inches) to fill to the top of the crucible with charcoal. By leaving draft holes in the brick wall at the bottom below the grate (made of the iron bars) on two or three sides, there will be sufficient draft to keep the lead hot. Place the shank of the knife blade in the tongs, at right angles with the jaws, and let the tongs rest on the top of the crucible, while the knife blade is submerged in the heated lead. Have two pair of tongs, and put in a cold blade before taking out the hot one to work. Grease the blade with some cheap grease which will prevent the lead adhering to the article. By having two or three pairs of tongs, the articles will heat as fast as they can be hardened. I have used the process for years when in the cutlery business in New England.—S. A. W. of Iowa.

PUMPING WATER FROM LONG DISTANCES.—M. W. Q., of Mo., is mistaken in saying that "ten feet horizontal is equal to one foot perpendicular." The distance horizontally from which water is brought to a suction pump is of small consequence, if only the pipe be large enough to reduce the friction to a minimum; because friction is the only obstacle to the conveyance of water to any distance horizontally, if only the air be exhausted from one end of the pipe. All suction pumps that draw the water for a considerable distance horizontally or vertically should have a vacuum vessel. At every stroke of the piston, the entire column of water, of whatever hight or length, is put into rapid motion, and if there be no vacuum vessel, the motion of the column is suddenly checked at the end of the stroke, and a great effort is required at the commencement of it to set the column into motion again. A vacuum vessel, which should be of ample capacity, will prevent all shock by the column at the end of the stroke, and all jerk at the beginning of it. I have now four pumps with vacuum vessels, driven by steam, all of them drawing fluids horizontally with great ease, without jerk or shock. The vacuum vessels, in my case, are simply pieces of gas pipe, two inches in diameter and four feet long, joined with the suction pipe just under the pump by an inch and a quarter connection. One pump, with leaden pipe, has a piece of leaden one and a half inch pipe, five feet long, soldered to the suction in the same position. The action is perfect. The longer the distance horizontally, the larger the suction pipe must be to avoid friction.—N. D., of Me.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—RESISTANCE OF BRASS TO PRESSURE.—How much internal steam pressure per square inch will a cylinder, nine inches in diameter, thirteen inches long, made of twenty-four gage sheet brass, stand?—J. S.

2.—POCKET ELECTRIC BATTERY.—Will some electrician inform me if I can make a battery small enough to be carried in a coat pocket, and powerful enough to give an electric light? A mere spark is all that is wanted. What is the best form of battery?—J. S.

3.—TANNATE OF SODA.—In the SCIENTIFIC AMERICAN of October 28th, there is an article on boiler incrustation. Dr. J. G. Rogers recommends, as a preventive, tannate of soda; will he, or some one else, inform me what quantity to use, say for a 40 horse boiler using 100 barrels water per day?—E. F.

4.—GRAPE JUICE.—Having a quantity of grape juice, in casks, which is now fermenting, I would like to know how to make it into good wine.—M. T. M.

5.—FITTING MOLDING.—Can any of the readers of the SCIENTIFIC AMERICAN give me a rule for fitting rake and crown molding, or cornice, that will work to better advantage than sawing it up, which is seldom an easy job, when the jet is wide and the staging is narrow, as is often the case at the corners when jacks are used for a staging?—S.

6.—BEES IN WINTER.—Will bees smother in their hives if they happen to get covered up with snow all winter? My bees are near a fence, on the summer stand, twenty inches from the ground, and the hives ventilated from bottom only. How much honey will a stock consume in a winter?—J. E. R.

7.—SOFTENING OIL STONES.—Is there any process that will have a tendency to soften an oil stone? I am a mechanic and have a great deal of trouble in getting a good oil stone, they all being too hard.—C. R.

8.—GLUE FOR JEWELLERS.—I would like to know the best glue to use at a watch maker's and jeweller's bench, for general purposes in that line of business. Also the best method of tempering lifting springs for watch cases.—R. K.

9.—CEMENT FOR MENDING CHINA, GLASS, ETC.—Can any of your correspondents give me a recipe for making a cement for mending china, glass, etc., which will set quickly, and stand hot and cold water? I have tried every thing *for sale* and have made quantities of cement from book receipts, but the result is the same. Can a cement be made with soluble glass?—G. H. J.

10.—PRESERVATION OF BELTING.—Where can I get the best information in regard to the use, treatment, and care of belting, especially leather belting? I am troubled with the rapid wearing out of belts running at high velocity.—W. L.

11.—ENAMELING CAST IRON.—Will some one please give us, through your paper, a practical receipt for enameling cast iron, with such enamel as is put on kettles?—W., BROTHERS.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

DISCOVERY IN HOROLOGY.—J. M.
FIREPROOF BUILDINGS.—J. R. M.
INCOMBUSTIBLE LUMBER.—E. C.
PERPETUAL MOTION.—A. J. R.
PSYCHIC FORCE.—A. M. L.—J. M. D.
STANDARD TIME.—F. A. S.
WAVE POWER.—U. S.
ANSWERS TO CORRESPONDENTS.—C. H. K.—G. H. S.—J. G. H. J. R. J.—J. S. G. S.—M. D. C.—T. L. V. D.—W. J. W.
QUERIES.—C. & H.—C. S. & J. M.—G. W.—I.—S. B. A.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HAY TEDDER.—John K. Collins, of Hartford, Vt.—This invention relates to a new manner of hanging the forks of a hay tedder, and is an improvement upon a patent granted to the same inventor, October 12, 1869. The axle or cross beam of the hay tedder is supported by wheels and made part of a frame, in which are the bearings of a crank shaft, operating the forks. Rotary motion is transmitted from one or both of the wheels to the crank shaft by a gearing chain or other means. The cranks of the shaft pass through journals affixed to the lower parts of rods, the upper ends of which are slotted and connected with a pin, in the forked ends of levers, hinged to the axle or other part of the frame. From the front ends of the levers are suspended, by a pin, the shanks of the fork. The lower part of each shank passes through a tubular guide. The crank in revolving causes the rod to vibrate on the pin, and to impart, by means of the connection, the same motion to the fork. The fork is made self-adjusting to the formation of, and made to drop in actual contact with, the ground, to be most effective in operation. To the lower end of each shank is secured a ferrule, which carries at its lower end a transverse tube. Through this tube is fitted a short rod, around the ends of which wires, constituting the tines of the fork, are wound. The upper ends of these wires are secured in small tubular sockets that project from the sides of the ferrule.

WALKING PLANTER.—Nathan Earlywine, of Centerville, Iowa, assignor to himself and Charles A. Davis, of St. Louis, Mo.—This is a machine for seeding, distribution of fertilizers, etc., for corn, cotton, and other crops. The seed or fertilizer may be dropped in a continuous drill, or intermittently as desired for crops grown on hills like corn. The machine is light and graceful in design, and seems a good and efficient one.

SPARK ARRESTER FOR STEAM BOILER.—John Gates, Portland, Oregon.—This invention consists in an improved spark arrester for steam boilers, in which the inventor takes advantage of the angle or turn which the air and smoke makes from the horizontal tubes to the perpendicular smoke stack. The greater velocity of the coals, owing to their greater weight, carries them past the lower entrance of the smoke stack to where there is an eddy, or at least insufficient draft to lift them, so that they will fall to the bottom of the smoke box. At this bottom there is a water well. On boats the same may be produced by cutting an opening or slot through the bottom of the boat, so that the coal, etc., will fall directly into the water that carries the boat. The water well may also be provided with two sets of inclined apertures or pipes, through one of which the water enters, while it escapes through the other during the movement of the boat. A constant current of water passes thus through the well, carrying off the coal and sparks. The well may, if desired, be of other construction, so as not to be connected with the bottom of the boat. It may, for stationary boilers or on locomotives, be only a plain water vessel. A wire or perforated screen is set in the smoke box at some distance from the tubes, so that the sparks are thrown under the screen, and are thereby kept from ascending the smoke stack. By this invention, it is claimed, the coals are arrested without making the smoke stack heavy; as the screen is set in the smoke box, with the exhaust above, less volume of vapor is carried through the screen than would be if it were on top, and it is also, therefore, less liable to foul. The coals, when once dropped, never rise again as in other spark arresters, where they dance against the screen until broken fine enough to pass through. The well furnishes good opportunities for getting rid of the blow off pipes and deadening the noise usually made by them.

PERMUTATION LOCK.—Samuel C. Weddington, Jonesborough, Ind.—Each tumbler is provided with a circle of holes with changeable pins, and a groove around its periphery. Each groove has a wire attached at one end to the case of the lock, and by the other end to an adjustable nut block on a screw. These tumblers are kept in their proper positions by the tension of wires, and the tension is increased or diminished by adjusting the nut on the screw. Changes in the combination are made by changing the positions of one or more of the pins in the holes of the tumblers. By an arm on the spindle of the knob, the tumblers are turned and the bolt operated. A recess in the bed tumbler receives the arm and gives it a hold on the tumbler. This tumbler is of irregular form, one end reaching to near the edge of the case, to which is attached a rod, the other end of which is attached to a bolt. The bolt is actuated by means of this rod, as the tumbler is turned by means of the arm on the spindle. Each of the tumblers above the bed tumbler is provided with a slot, which admits the stem of a bolt when the tumblers are properly arranged. The shifting tumbler has a recess in its under side, which receives the spindle arm as the knob is pressed in, by which means the shifting tumbler and the other tumblers are turned and adjusted to the proper position for receiving the stem of the bolt. The edge of the shifting tumbler is cut into a succession of arcs of circles corresponding in number with the holes in the tumblers, and is kept in position, and the changes are indicated, by means of a pulley which revolves in the end of a spring lever. In moving or adjusting the tumblers, the arm on the spindle will be in the recess in the shifting tumbler, and the tumblers are put in position by turning the knob, the shifting tumbler serving as a dial, a single mark only for a starting point being necessary. As the shifting tumbler is turned, a click will be heard as the pulley on the spring lever passes from off one arc to another, or the friction will indicate its passage, an account of which is kept. The combination being known, the number of arcs indicates the position of the tumbler, and brings the slots in all the tumblers to one position. When this is done the knob is slightly drawn back, so that the arm on the spindle engages with the recess in the bed tumbler: then, by turning the knob, the bolt is drawn back and the door is unlocked.

SAW SET.—This is an improvement upon an invention patented by the same inventor, Erastus Y. Clark, of New York city, April 19, 1870, and which is calculated to supply certain defects and perfect the original device. The present invention consists in applying to the saw set a supporting slide for sustaining the saw as it moves across the apron and anvil during the process of setting, by which the narrowest saw may be securely held and guided over the anvil to bring the teeth properly under the action of the punch.

SEED PLANTER.—Judging from the activity in this class of improvements, the demand for them must be very large, and almost any invention of the kind that can hold its own with those already in market, or better still, make decided advances on the devices already introduced, is, it would seem, sure of sale. The invention under notice is, like most others of its kind, a combination of movements designed to perform all that others have done, and to supply their deficiencies. The combination is essentially simple, and is, we judge, well calculated to secure approval from agriculturists, providing all necessary adjustments to adapt to different kinds of work. Patented by Ezra E. Chesney, of Bushnell, Ill.

COMBINED SEEDER AND CULTIVATOR.—This invention consists in an improved frame on wheels adapted to receive either a cultivating, planting, or a seed dropping device. The invention provides for side variation to prevent tearing up rows in cultivating corn, furnishes a convenient seat for the driver, and places the operation entirely within his control, provides for turning at the ends of rows or the passage of stones, stumps, etc.; for regulating the depth of drills, and supplies adjustments for adapting the machine to sowing in drills or broadcast, regulates the proportion of seed to the area to be sown, and in short furnishes all the appliances necessary to perform the operations named with facility and uniformity. The patentee is Jacob W. Webb, of New Athens, Ohio.

BEE HIVE.—This new form of bee hive provides for perfect ventilation in summer, and protection of the bees from cold in winter, for the convenient abstraction of honey, and the prevention of injury to the bees from moths. It also provides improved support for the combs, and general facilities for the scientific management of bees. The details cannot well be verbally described. The invention has been patented by William R. Clark, of Piqua Ohio.

PAPER FOLDING MACHINE.—This is an important invention. The foldin apparatus is designed to be attached to printing presses to receive the sheets as they are deposited by the fly. It is impossible to describe in brief the ingenious mechanism which accomplishes the desired results and delivers the papers folded from the press; but it is simple and compact, and is, we judge, an important advance in this class of machinery. Mr. Richard R. Gubbins, of Troy, N. Y., assignor to himself, Patrick J. Fitzgerald and Lewis H. Dezouche, of the same place, is the inventor.

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APPARATUS FOR CONVERTING MOTION.—Joseph Julien Chenal, of Génissiat, (Ain,) France.—This is an improvement on that for which a patent was issued to Edward Wadham, dated July 11, 1865. In his invention, a rocking or oscillating lever is widened out, at the point where resistance is applied, into a sectoral slot or frame that is armed with teeth so as to engage with mutilated pinions keyed on a shaft passing through said slot or frame. The frame is, however, so constructed, and the pinions so connected with sleeves that turn backward on the shaft, as to cause considerable friction. This the present inventor claims to have obviated by a peculiar construction or arrangement of racks and pinions or toothed disks, as hereinafter set forth. The number of teeth in each disk or pinion is such that, as soon as one ceases to be in gear with its rack, the other will at once mesh with its rack without interruption or dead point. A fly wheel may be fitted on the shaft so as to regulate the motion, which may then be communicated to machinery by any of the known means. Thus the shaft receives a continuous rotary motion, and the action of the two racks gearing alternately, as the lever oscillates, into the partly toothed sectors, (or sectoral pinions,) may be compared to the working of a pinion toothed all round, into which two sectors gear alternately, each on its own side, and moving in opposite directions. Instead of a simple arm, the motive lever may have another arm attached to the other side of the slotted rack frame, thus affording the means of applying additional power, and this second arm will act as a lever of the second kind. Also, in case two arms are used, each of them may have its own slotted double concentric rack frame, communicating motion to two separate shafts; or, the motion of these two shafts may be jointly imparted to one single main shaft—in this case each of the arms of the levers acts both as a lever of the first and second kind. Conversely, by deriving motion from the shaft the continuous rotary motion of the said shaft will communicate an alternate or rocking motion to the lever.

CAT BALLS.—Thomas H. Joyce, of New York city, assignor to himself and Jacob Cohen, of same place.—This invention has for its object to furnish an improved toy for boys, to be used in playing in a manner similar to the game known as "old cat;" and it consists in the toy constructed as hereinafter more fully described. A piece of wood is made in the form of a rectangular pyramid, with the lower part of one side cut off, the face thus formed being the base or bottom of the toy when arranged for play. In the side of the block opposite, from the bottom or cut off part is formed a circular recess, to receive the ball. The ball may be made of wood, rubber, or other suitable material, cork being preferred, as being elastic, and, at the same time light, so that, should it strike a person or thing, it will cause no injury. In playing with this toy the block is arranged with the ball in the recess. The upwardly projecting, or pointed end of the block is then struck a sharp downward blow with a bat or stick, which projects the ball into the air, and the ball must be hit with the bat or stick before it falls to the ground.

SHOVEL HANDLE.—Frank Alsip, of North McGregor, Iowa.—A hand piece is fitted on and secured by bolts or rivets to the lower part of the handle, at or near the upper ends of the straps of the blade. The hand piece projects forward, and its lower end is supported by a brace, the outer end of which is securely attached to the lower end of the said hand piece, and its lower end is attached to the handle at or near the upper end of the blade or plate, By this construction the forward hand of the person using the tool is very greatly relieved of the weight thrown upon it, by bearing down upon the upper end of the handle with the other hand to balance or raise the weight upon the shovel. This invention also relieves the person using the tool from the necessity of stooping so low to lift it as he must with the ordinary construction.

METALLIC CARTRIDGE.—Charles Felix de Dartein and Jules Edouard de Dartein, of Strasbourg, France.—This is an improvement in the class of cartridges so constructed that when the charge is exploded it closes the crevices that exist between the revolving cylinder and the barrel of arms of the revolver class, and at the breech ends of other arms, so as to prevent the escape of gas rearward, and the consequent loss of projective force; and also to produce a cartridge adapted to cause the commencement of the rotation of the ball or bullet before leaving it. To this end the invention consists in providing the front end of the cartridge case with a metallic cap having an aperture for the passage of the bullets, and in forming spiral ribs or grooves on the inside of the said ferrule or lining.

CHAIN LOCK.—Levi F. Cahn, of New York city.—This invention relates to an improvement in the little ornamental padlocks which are applied to watch chains for securing the ends of the same to the garments. The object of the present invention is so to construct and arrange said lock that it cannot be easily opened and removed by thieves, but quite conveniently by its owner. The invention consists in applying the knob above the pivot of the bolt. This will necessitate the pulling of the knob for opening the lock, while heretofore it was made to be pushed. It will be seen that it is much more difficult for a thief to unlock this fastener than those which are opened by gentle pressure against a knob or pin; while for the owner it is equally convenient.

WATCHMAKERS' TOOL.—Leonard C. Butch, of Lancaster, and Augustin F. Thoma, of Piqua, Ohio.—This invention relates to a new and improved tool, adapted for several uses in the watch makers' or repairers' trade, such as holding the balance wheel staff for removing the roller table, replacing the said roller on the staff, "poising" the balance, and holding screws, the said tool being constructed and arranged in a peculiar manner to secure the desired end. The tool as constructed is complete in itself—that is to say, is self-supporting, and does not require to be fastened in a vise, as other tools for a similar purpose have to be.

STREET CROSSING.—John Schley, of Savannah, Georgia.—An endless carrier chain is arranged on suitable pulleys, in connection with an arch. The chain is attached to a car, having a rectangular frame over the top. Four spur wheels, preferably of exactly the same diameter, are attached to the car. On the outside of the frame is journaled one front and one rear wheel, near corners diagonally opposite. On the inside and to the car proper are correspondingly journaled the other front and rear wheel. These wheels are cogged so as to work in suitable racks on rails. In order to obtain greater bearing surface and produce perfect steadiness in the car while moving, the inventor uses, in connection with each cog wheel, a smooth traction wheel, attached fixedly thereto, and intended to run upon an ordinary smooth rail beside the cogged rail. The tracks are of the same length, but each as much shorter at one end than the other as is the distance between the axes of the front and rear wheels. The outside track, on which the front wheel has entered, is as much lower than the one on which the rear wheel runs as is necessary to preserve the axes of the front and rear wheels in a horizontal plane. This continues to the top level of the arch, when the outside track rises to the same plane with the other. Upon the opposite side of the arch the outside track continues upon the top of the arch, while the front wheel track is as much depressed upon the decline as was the rear wheel track upon the incline. The vehicle moves continuously back and forth over the arch, always in a horizontal position, and without being turned around.

COFFEE POT STAND.—Oliver Ferris, of Pawling, N. Y.—The object of this invention is to furnish convenient means for pouring coffee, tea, and other liquids from coffee or tea-pots, or similar vessels, without handling such vessels; and it consists of an adjustable stand or platform, arranged to swing on pivots to an inclined position. The vessel is supported and prevented from slipping off the plate by curved stays attached to the tops of arms so that they move with the plate. The latter is operated by a lever or handle. By this arrangement the coffee pot is elevated sufficiently to discharge all the liquid by simply inclining the plate, as described. This is a great relief to the female presiding at the table. The coffee is less likely to be agitated or roiled, as the movement of the pot is more gentle than when it is handled in the usual manner.

OIL CAN.—Donald D. Mackay, of Whitestone, N. Y. and Cyrus Butler, of New York city.—This is a can for holding and applying oils containing plumbago and other heavy matters not combining with the oil, but which settle down upon the bottom of the can and require to be stirred up and mixed with the oil before pouring it out; and it consists in the application, to the interior of an ordinary spring bottom or other can, of a rotary agitating device, and a crank upon the outside for turning it, the spindle of the crank passing through the shell and gearing with the spindle of the agitators.

SEATS FOR CHAIRS AND STOOLS.—This invention relates to a new construction of upholstered chair and stool seats, and has for its object to simplify the same in such manner that can be cheaply produced, and still retain any desired shape that can be formed of wood or metal, and possessing all the elasticity acquired in an ordinary cushion. It consists chiefly in making the solid part of the seat from a perforated recessed piece of wood or metal, which admits the application of the stuffing from beneath. The stuffing, of hair or other material, is introduced between the bottom and cover, after the latter has been fastened to the bottom through a hole in the center of the bottom. By this mode of stuffing a perfect shape can be produced, and, it is claimed, best workmanship obtained at little expense. Such upholstering was heretofore performed by placing the stuffing upon the plain upper surface of the seat, dispersing it thereon as well as possible, and then stretching the cover over the whole. In this manner a good surface and finish could only be obtained with great difficulty, and with the aid of experts, while the present process can, it is stated, be satisfactorily carried out by ordinary hands.—Fletcher W. Dickerman, of New York city, is the inventor.

PERMUTATION LOCK.—John F. Vinton and George A. Hines, of Brattleborough, Vt., assignors of one third their right to Seymour Field, of same place.—This invention mainly consists in an improved arrangement of mechanism with the bolt, locking dog and its lever, the driving wheel and its inner ring, and a tubular bearing connected with the spindle; the object being to produce a lock simple in construction, not liable to get out of order, and hence reliable in operation, and capable of resisting improper attempts to manipulate it. The nature of the mechanism precludes further description, but inspection of the specifications and drawings gives evidence that the lock is a good one.

PRINTING PRESS.—Berthold Huber, of Williamsburgh, New York,—This is an improved movement for printing presses, which shall be so constructed and arranged as to cause the cylinder and bedplate to move at the same rate of speed while in contact, but will cause the bedplate to move at a greater rate of speed while the cylinder and bedplate are not in contact, thus enabling the cylinder to be made smaller than is possible when the cylinder and bedplate move always at the same velocity. The invention consists in the construction and combination of various parts, including a varying crank, in combination with the guide groove and the cylinder of a printing press for driving the bedplate with a variable motion, and a combination of the levers or equivalent with the bedplate, variable crank, guide groove, and cylinder for connecting the variable crank with the bedplate.

ELEVATOR.—David F. Skinner and Joseph Arnold, of Albany, N. Y.—This invention relates to improvements in elevators; and it consists in a novel arrangement of means whereby a weighted lever of a friction brake, employed to regulate the descent of the platform, may be used to actuate the belt shifter and throw the belt on the fast pulley for raising the platform simultaneously with the releasing of the friction or not, as preferred. Also to throw off the belt or stop the platform simultaneously with the application of the friction brake to hold the platform at any point, the arrangement being such that the friction brake may be released sufficiently to let the platform down without throwing the belt on the fast pulley.

FRUIT BASKET.—Henry Carpenter, of Williamsburgh, New York.—This is an improved fruit basket for sending fruit to market, and for use upon stands, to enable the purchaser to carry away his fruit conveniently and safely, and which may be used for various other purposes. It is formed of three strips, strengthened at the upper edge by a band and in the middle part by a strip or handle extended around the sides and bottom, with additional bands if desired.

WASHING MACHINES.—John Fox, of Farmersville, Iowa.—This invention has for its object to furnish an improved washing machine, simple in construction, convenient in use, and effective in operation, doing its work quickly and thoroughly, and without injury to the most delicate fabrics. A vertical shaft actuated by a spur wheel rack bar and lever causes vertical pins to rotate back and forth within the case, to agitate the suds and clothing. The legs of the case are attached to the case by armed sockets.

COMBINATION LEVER BRIDLE BIT.—Henry M. Cornell, of Brighton, Ill.—This invention consists in forming the bit of two parts fitted together so as to form a single round bit, and arranged to slide one upon the other so that tension on the reins will cause them to extend laterally from the animal's mouth while the bars or loops into which the reins buckle will be drawn toward each other as close as the animal's mouth will permit, producing a strong pressure, and at the same time making a double extension lever.

FOLDING BEDS.—Wendell Wright, of Bloomfield, N. J.—The object of this invention is to so construct a bedstead that it may be folded up in a small space, and at the same time be durable and simple in its parts, applying as well to spring bottom as to other bedsteads. Bedsteads may in this manner be manufactured and finished complete, and packed in very small compass for transportation, or for storing when not in use. The advantages of this improvement must be apparent to all.

HASP LOCK.—George Crompton, Jersey City, N. J.—This invention furnishes an improved trunk lock, so constructed as not to require the front of the trunk to be cut away to allow the lock to be attached. Its principal feature consists in the combination of a pivoted lock bar with the locking jaws which are pivoted to the hasp.

SINGLE HARNESS.—Charles Richard Stewart, Winslow, Me.—This invention has for its object to furnish an improved single harness for attaching a horse to a pair of thills, which shall be more comfortable for the horse, and which will give the horse a better control over the carriage. When the horse is pulling, the breeching will not be in contact with him, and, when holding back, the breast pads will be withdrawn from his breast, so that the only part of the harness that will be constantly in contact with the horse will be the supporting strap.

SEED DROPPER.—Joseph C. Barlow, Quincy, Ill., assignor to Vandiver Corn Planter Company, same place.—This invention is an improved cut off for corn planters and other seeders, to brush off the superfluous grains after the holes or chambers of the dropping plate have been filled, and it is so constructed as not to injure or break the seeds. An arrangement of the two angular plates in juxtaposition to one another, and a combination of plates and springs, constitute the features upon which a patent has been obtained.

MACHINE FOR WIRING BLINDS.—James H. Nelson, of Little Falls, N. Y., assignor to himself and Byrom K. Houghton, of same place. This invention consists in driving two staples across one another and successively into the slat and strip of a blind; also, in holding the slat; also, in certain improvements upon the operative mechanism, the latter of a nature that precludes a mere verbal description, but which forms a small, compact, and easily operated machine for the purpose intended.

CRUCIBLE FOR MELTING METAL.—Richard Yeilding, Detroit, Mich.—The inventor provides the ordinary crucibles of plumbago or other substance with a flue or passage from the bottom to the top, for allowing the heat to act upon the center of the mass of metal contained in the crucible more directly than it otherwise can, the said passage to be surrounded by a shell or tube of the same material that the other part of the crucible is made of. He also grooves, indents, or constructs the sides or walls of the crucible, both inside and out, to form projections, to interlock with the paste or clay or other substance with which the crucible is coated, to cause the said coatings to be retained much longer than they now are, thereby preserving the crucibles much longer, and thus cheapening the cost of melting steel or other metals. He states that he finds in practice, by this improvement, that the crucibles are capable of being used from six to ten times as much as in the ordinary way, and that the metal can be reduced much quicker, and with considerably less fuel in crucibles having the passage through the metal holding space.

CARRIAGE WHEEL.—Isaac E. Bower, Bainbridge, Ga.—This improvement in the construction of the rims of carriage wheels consists in forming the rims of thin sheet iron or steel bent into the form of three sides of a rectangular figure or triangular shape, in cross section, with metal sockets for the ends of the spokes, said sockets being riveted to the tread of the rim when in rectangular form, but, when in triangular form, secured to the apex of the angle, or an extension of the sides meeting at the apex. These rims may be filled with wood rims if preferred, and will hold the said wood rims very securely. The triangular rim may have a vertical rim for bracing the center of the tire, said rim being bolted or secured between the flanges.

BURIAL APPARATUS.—William H. McGavran, Connotton, Ohio.—The object of this invention is to economize labor in the lowering of coffins and the filling of graves. The invention consists in the arrangement of a receptacle for the earth dug out of the grave, and in the application thereto of a windlass for lowering the coffin. The earth receptacle or box has a slanting back and sectional removable front, so that after the coffin has been let down the front may be taken off and the earth allowed to flow freely into the grave until the same is closed. The burial box is made of wood or other material, of proper size for holding the earth dug from a grave. The back of the box stands inclined upon a narrow bottom. The front of the box consists of a series of sections or boards which can be removed. The ends of the boards have handles which fit into notches or recesses in the supporting posts of the box. Suitable hooks or catches are applied to the sides of the box for holding the boards in place. In brackets that project from the fron of the box are the bearings of a windlass which can be turned by hand. The box is, on wheels, rolled to the place where a grave is to be dug, or is carried thither either together or in pieces, and then put together. The earth dug out is thrown into the box, the boards being put on upwardly as the box is filling. The coffin is placed upon sticks over the grave, as usual. Ropes or bands are then drawn under it and fastened to the windlass, which is turned by hand to lower the coffin into the grave subsequent to the removal of the supporting sticks. The coffin having been let down, the lower board is taken off and the earth allowed to flow into the grave, filling it up. Enough earth will remain on the bottom for rounding the grave. More than the lower board may be taken off if it is desired to still more hasten the operation. By the use of this apparatus considerable labor is saved, so that two men will be enabled to perform the service for which four are now required.

CHAINS FOR WATCHES, ETC.—George W. Clampitt, Attleborough, assignor to Henry F. Barrows, North Attleborough, Mass.—This invention consists in fastening the ends of the staples used for connecting the links of wide gold or other chains by lapping the said ends by each other, and bending or hooking them over the outer row of rings in such manner as to accomplish the fastening by bending only, which saves considerable labor heretofore expended in soldering the ends of the staples together, the said ends being bolted against each other. It also saves the solder and much labor heretofore used in removing the discoloring of the edge of the chain exposed to the heat in soldering; and there are no soldered portions exposed to view, or parts discolored by solder. The final part of the bending is done by a punch struck by a hammer, which delivers a blow upon the chain edgewise in such manner as to shorten the staples and secure the links more closely together than they can be when soldered, thus making a more compact chain.

SEWING MACHINE.—Adam Barth and Nicholas Barth, St. Louis, Mo.—This invention consists in an improvement of sewing machine feed mechanism, the advantages to be gained by which are that it shall dispense with a presser foot, and with the friction consequent to the use of the same, and that it can be used, together with the lower feed, for crimping and ruffling on either side. A vertical slide carries the upper feed wheel, and is attached to a laterally adjustable bar. A wheel is connected by a chain with this upper feed wheel, and is combined with a lever, adjustable rod, and crank arbor, by which motion is imparted to the feed.

CHILDREN'S CARRIAGE.—Chauncey Holt, Jersey City, N. J.—The object of this invention is to provide a children's perambulator or carriage with a drawer, wherein to keep articles of food and other appliances that may be necessary or convenient for use of small children. The invention consists in the application of a drawer to a children's carriage, when arranged in the lower part of the carriage body in guides, and so that it can be operated by being drawn backward, forward, or to the side.

CULTIVATOR.—Jerome H. Tomlinson, of Mount Carroll, Ill.—The object of this invention is to so connect the plow beams with the axle bearings of the wheels that the lateral motion of the plows will be inversely followed by a similar twist of the wheels. By the arrangement employed, it is claimed that the operator has complete power to govern the side movement of the forward as well as the hind end of the plows, and crooked rows can be plowed with greater ease than without this device. The plow requires less care in driving, for the wheels will adjust themselves to keep always in front of the plows. No up or down movement of the plows, only their side movement, will affect the motion of the wheels. Whenever the team gets off the rows, it is only necessary to swing the plows aside, whereby the wheels are set so as to affect the motion of the wheel.

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121,036.—STEREOTYPES.—F. H. Aiken, Franklin, N. H.
121,037.—REFRIGERATOR.—A. W. Almqvist, Long Island city, E. G. Conradson, Brooklyn, N. Y.
121,038.—COMPOUND.—T. Bathy, Smith's Creek, Mich.
121,039.—TIGHTENING TIRES.—H. Beckwith, Grass Lake, Mich.
121,040.—JOURNAL BOX.—J. D. Beers, Phila., Pa.
121,041.—GALLEY.—J. F. Bronson, Waterbury, Conn.
121,042.—WASHER, ETC.—G. R. Clarke, New York city.
121,043.—THREAD RACK.—J. L. Demarest, Elmira, N. Y.
121,044.—COMPOSITION.—J. E. Dotch, Washington, D. C.
121,045.—FELTING MACHINE.—R. Eickemeyer, New York city.
121,046.—HEMMER.—H. A. Ellis, Albany, N. Y.
121,047.—COUPLING.—J. M. & J. Enos, St. Joseph, Mich.
121,048.—HORSE POWER.—L. R. Faught, Phila., Pa.
121,049.—CIGAR LIGHTER.—M. F. Gale, New York city.
121,050.—BRUSH.—H. A. Harvey, Orange, N. J.
121,051.—COUPLING.—J. B. Heverling, Greenville, O.
121,052.—PROPULSION.—J. A. Howell, U. S. Navy.
121,053.—STOVE.—S. Ketchum, Macon, Ill.
121,054.—BASKET.—J. Knapp, Coloma, Mich.
121,055.—LUBRICATOR.—C. Lynch, Detroit, Mich.
121,056.—KITE.—O. Maddaus, Brooklyn, N. Y.
121,057.—BENDING SKELPS.—G. Matheson, Boston, Mass.
121,058.—BENCH, ETC.—E. Milner, Strathroy, Canada.
121,059.—TOOL.—H. F. Moeller, H. P. Brandt, Davenport, Iowa
121,060.—SCREW BOLT.—F. Mutimer, Rockford, Ill.
121,061.—HARVESTER.—P. Nicola, Massillon, O.
121,062.—SMOKE STACK.—T. B. Phoebus, Memphis, Tenn.

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121,063.—ROOFING.—O. J. Pierce, Worcester, Mass.
121,064.—ENGINE.—E. H. Rees, Mansfield, O.
121,065.—FILTER.—A. F. Schmidt, Davenport, Iowa.
121,066.—MUTATION SCALE.—J. H. Scott, Kickapoo, Ill.
121,067.—PERCH.—L. T. Stetson, Randolph, Mass.
121,068.—EARTH CLOSET.—R. R. Strain, San Francisco, Cal.
121,069.—BLACKING BOX.—A. M. Utley, Watertown, N. Y.
121,070.—DESK, ETC.—W. Watson, Visalia, Cal.
121,071.—TEA KETTLE.—A. F. Wolf, Beaver Falls, Pa.
121,072.—TWEER.—A. M. Worthing, Reno, Nev.
121,073.—FENDER.—C. C. Algeo, Pittsburgh, Pa.
121,074.—BORER.—F. S. Allen, C. F. Ritchel, New York city.
121,075.—CAR WHEEL.—A. G. Barrett, Barrett, Kan.
121,076.—FASTENER.—H. M. Eidwell, New Haven, Conn.
121,077.—PIANO ACTION.—D. L. Bollermann, Mt. Vernon, N.Y.
121,078.—TIRE MACHINE.—W. Bowden, White's Corners, N.Y.
121,079.—GENERATOR.—A. D. Brock, Washington, D. C.
121,080.—CHAIR.—H. Buchter, Louisville, Ky.
121,081.—JACK.—W. S. Burgin, Washington, Vt.
121,082.—PAVEMENT.—C. Burlew, Washington, D. C.
121,083.—WRENCH.—L. Chapman, Collinsville, Conn.
121,084.—KNIFE.—T. M. Clarke. Winsted, Conn.
121,085.—FANNING MILL.—D. Collins, Zanesville, O.
121,086.—DUMP CART.—G. L. Collins, Trenton, N. J.
121,087.—BALING PRESS.—J. S. Cook, West Groton, Mass.
121,088.—SPIRIT LEVEL.—L. L. Davis, Springfield, Mass.
121,089.—LAMP BRACKET.—R. S. Dennison, Winsted, Conn.
121,090.—HARVESTER.—P. M. Donohoo, St. Rose, Wis.
121,091.—URN, ETC.—W. J. Evans, New York city.
121,092.—SKATE.—E. L. Fenerty, Halifax, Canada.
121,093.—BORER, ETC.—T. Flesher, Dunkirk, N. Y.
121,094.—ROCKER.—J. N. Fowler, New York city.
121,095.—WINDMILL.—H. H. Frank, P. Hansen, Richton, Ill.
121,096.—KEY.—E. L. Gaylord, Bridgeport, Conn.
121,097.—GRATE.—W. A. Greene, Brooklyn, N. Y.
121,098.—SASH HOLDER.—J. C. Hanna, Rossville, Iowa.
121,099.—STAMP.—T. C. Hargrave, Boston, Mass.
121,100.—STUD.—A. Hartmann, New York city.
121,101.—STOVE.—L. Hermance, Lansingburgh, N. Y.
121,102.—TELEGRAPH.—R. Herring, Canonbury, England.
121,103.—PISTON.—W. H. Holland, Boston, Mass.
121,104.—PIPE ELBOW.—G. W. Howell, Covington, Ky.
121,105.—SHINGLE MACHINE.—E. Hughes, Gowie, Can.
121,106.—BARREL.—M. G. Huntley, Grand Rapids, Mich.
121,107.—HARVESTER.—J. H. Keller, Boalsburg, D. F. Luse, Center Hall, Pa.
121,108.—CART.—J. King, Oswego, N. Y.
121,109.—GOVERNOR.—A. K. Kline, Readington, N. J.
121,110.—DICE.—A. Klingenburg, Baltimore, Md.
121,111.—BED BOTTOM.—M. Kohn. Hartford, Conn.
121,112.—CHAIR SEATING.—M. Kohn, Hartford, Conn.
121,113.—HOIST.—S. L. Lord, New York city.
121,114.—CULTIVATOR.—A. M. Manny, Lena, Ill.
121,115.—CULTIVATOR.—A. M. Manny, Lena, Ill.
121,116.—CORN PLANTER.—J. Matthews, Lincoln, Ill.
121,117.—CUTTING CARDS, ETC.—V.E.Mauger, New York city.
121,118.—CEMENT, ETC.—J. McKenzie, J.M.Stebbins, Phila., Pa.
121,119.—GLASS, ETC.—G. F. Morse, New York city.
121,120.—ROCK DRILL.—L. Nelson, Smyrna, Tenn.
121,121.—PRESS.—J. D. Nix, Noble, Ill.
121,122.—REGULATOR.—N. Nolan, New York city.
121,123.—HARVESTER.—C. N. Owen, Salem, Ohio.
121,124.—CARPET.—L. C. Palmer, Howard, Pa.
121,125.—WINDMILL.—L. Patric, Springfield, Ohio.
121,126.—COFFEE POT.—J. W. Patterson, New York city.
121,127.—DRYER, ETC.—M. Power, Chicago, Ill.
121,128.—FABRIC.—I. Rehn, Washington, D. C.
121,129.—ROAD DRESSER.—S. D. Reynolds, Rochelle, Ill.
121,130.—PAPER PULP.—J. A Rothe, Phila., Pa.
121,131.—LET OFF.—C. Schilling, Auburn, N. Y.
121,132.—LIFE PRESERVER.—T. R. Scott, New York city.
121,133.—PRESS.—J. A. Sivley, Clarksville, Tex.
121,134.—FILLING BARRELS.—F. Stitzel, Louisville, Ky.
121,135.—LINE REEL.—C. H. Staffin, Boston, Mass.
121,136.—WASHER. G.C.Taylor, J.B.Crisman, Port Jervis, N.Y.
121 137.—WATER WHEEL.—De W.C.Teller, Fort Plains, N.Y.
121,138.—SASH HOLDER.—C. T. Tessier, New York city.
121,139.—CAN.—L. Thomas, Phila., Pa.
121,140.—BRAKE.—I. Townsend, Capeville, Va.
121,141.—WOOD PEESERVER. J.G.Voorhies, Aqueduct Mills N.J.
121,142.—DOOR LOCK.—N. Warren, Wilmington, Del.
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121,144.—SAWER.—W. M. Wright, Galesburg. Ill.
121,145.—CAR SEAT.—J. M. Allen, Washington, D. C.
121,146.—PAINT.—D. R. Averill, New Centerville, N. Y.
121,147.—PAINT.—D. R. Averill, New Centerville, N. Y., J. Browning, Newburgh, Ohio.
121,148.—BUCKET.—A. Bauman, Toledo, Ohio.
121,149.—VISE.—J. D. Beck, Liberty, Pa.
121,150.—BRAKE.—J. F. Brode, Memphis, Tenn.
121,151.—PIPES. A.T.Brodie, R.R.Smith, J.T.Tyler, Pitts'gh, Pa.
121,152.—STOPPER.—M. W. Brown, New York city.
121,153.—PLOW.—L. E. Burdin, Lexington, Ky.
121,154.—CAN.—D. Burnet, Bedford Station, N. Y.
121,155.—SAFE.—J. W. Case, Ypsilanti, Mich.
121,156.—BOX.—J. Cohn, New York city.
121,157.—ROLLER.—J. Cole, Fredericksburg, Iowa.
121,158.—SWITCH.—C. L. Cooke, Shortsville, N.Y.
121,159.—HAY RAKE.—L. A. Crockett, Wythe Co. Va.,
121,160.—PIPE MACHINE.—A. J. Davis, Newark, N. J.
121,161.—LOOM.—H. G. Davis, Worcester, Mass.
121,162.—TREATING FAT. L.L.A.E.P.de la Peyrouse, Paris, Fr.
121,163.—PROPELLER.—L. de Lill, Phœnix, N. Y.
121,164.—STOVE.—N. Gergen, Buffalo, N. Y.
121,165.—LAMP POST.—L. A. Gouch, Yonkers, N. Y.
121,166.—ROOFING, ETC.—J. K. Griffin, Waterdown, Canada.
121,167.—LINE HOLDER.—J. B. Habecker, Newport, Pa.
121,168.—CAN.—J. W. Hannan, Elyria, Ohio.
121,169.—BED.—H. Hard, Akron, Ohio.
121,170.—GAS HEATER.—D. G. Haskins, Cambridge, Mass.
121,171.—SHOW CASE.—I. S. Huckins, Wenona, Mich.
121,172.—AX.—H. H. Parsons, Hoosick Falls, N. Y.
121,173.—ELECTROMAGNETIC ENGINE.S.S.Jones, N.Orleans, La.
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121,181.—GATE.—W. I. Ludlow, Cleveland, Ohio.
121,182.—TROLLING SPOON.—J. H. Mann, Syracuse, N. Y.
121,183.—KILN.—A. McBride, Lowell, Mich.
121,184.—TRAVELER.—W. B. McClure, Alexandria, Va.
121,185.—HEATER.—W. L. McDowell, Philadelphia, Pa.
121,186.—SEWING MACHINE.—L. A. Merriam, New York city.
121,187.—AXLE.—J. Montgomery, New York city.
121,188.—GATE.—J. D. Morrison, Richfield, Ill.
121,189.—TWEER IRON.—I. Nelson, Oswego, N. Y.
121,190.—LADDER.—J. S. Oakley, Passaic, N. J.
121,191.—BOOK HOLDER.—H. A. Oesterle, Philadelphia, Pa.
121,192.—SIEVE.—W. Page, Epsom, England.
121,193.—BUILDING BLOCK.—M. R. Pierce, New York city.
121,194.—FLASK, ETC.—L. T. Pyott, Philadelphia, Pa.
121,195.—WATER WHEEL.—W. Read, Patterson, N. Y.
121,196.—SHOW CASE.—W. H. Reiff, Philadelphia, Pa.
121,197.—FLOUR SIFTER.—C. Richardson, Philadelphia, Pa.
121,198.—CUTTER.—S. W. Robinson, Champaign, Ill.
121,199.—FIRE ARM.—J. Rupertus, Philadelphia, Pa.
121,200.—SCALES.—E. Sampson, Nassau, N. Y.
121,201.—FAUCET. J.Sargent and L.F.Munger, Rochester, N.Y.
121,202.—CHECK REIN.—J. Schofield, Worcester, Mass.
121,203.—WASHER.—J. J. Schroyer, Springfield. Ill.
121,204.—CORN PLANTER.—L. Scofield, Watertown, Wis.
121,205.—COMPOUND.—E. A. Shewell, Boston, Mass.
121,206.—COFFIN.—J. H. Shields, Louisville, Ky.
121,207.—PLOW.—G. B. Smith, Shopiere, Wis.
121,208.—DRYER.—O. S. Smith, C.R. Hopkins, Middletown, Ct.
121,209.—PUMP.—H. Spear, Portland, Me.
121,210.—CORSET, ETC.—L. Spigelmyer, Easton, Pa.
121,211.—METER.—D. B. Spooner, Syracuse, N. Y.
121,212.—CAR.—W. Stark, White Pigeon, Mich., J. G. Fisher, and S. Fitch, Toledo, O.
121,213.—CAR.—W. Stark, White Pigeon, Mich., J. G. Fisher, and S. Fitch, Toledo, O.
121,214.—CAR.—W. Stark, White Pigeon, Mich., J. G. Fisher. and S. Fitch, Toledo, O.
121,215.—SADDLERY.—J. Straus, St. Louis, Mo.
121,216.—WASHER.—D. P. Sulouff, Milton, Pa.
121,217.—WASHER.—D. P. Sulouff, Milton, Pa.
121,218.—ALARM.—A. Taylor, Brooklyn, N. Y.
121,219.—VAULT.—L. D. Tredway, St. Louis, Mo.
121,220.—THRASHER. P.Upton, J.B.Lobdell, Battle Creek, Mich.
121,221.—TAG.—T. Van Kannel, Cincinnati, O.
121,222.—GRAFTER.—D. S. Wagener, Pultney, N. Y.
121,223.—DRILL BIT, ETC.—P. M. Ward, Cow Run, Ohio.
121,224.—EYELET MACHINE. G.Wunderlich, Philadelphia, Pa.
121,225.—LINK.—S. F. Lamb, New Albany, Ind.

REISSUES.

4,638.—WRINGER.—R. B. Hugunin, Cleveland, O.—Patent No. 75,425, dated March 10, 1868.
4,639.—SEWING, ETC.—A. Judson, Newark. N. J.—Patent No. 68,828, dated September 10, 1867.
4,640.—CUT OFF.—J. E. McKay, New York city.—Patent No. 118,958, dated Sept. 12, 1871.
4,641.—BOLT MACHINE.—J. Minter, Lowell, Mass.—Patent No. 43,521, dated July 12, 1864; reissue No. 2,093, dated Oct. 17, 1865.
4,642.—HUB.—A. Warner, Hampden, Conn.—Patent No. 61-, 900, dated Feb. 5, 1867.
4,643.—HEATER.—S. F. Gold, Englewood, N. J., W. A. Foskett, New Haven, Conn.—Patent No. 36,000, dated July 29, 1862.
4,644.—FURNACE.—A. H. Mershon, Philadelphia, Pa.—Patent No. 55,138, dated May 29 1866.

DESIGNS.

5,365.—BADGE.—I. Bedichimer, Philadelphia, Pa.
5,366.—HINGE.—F. W. Brocksieper, New Haven, Conn.
5,367.—SHAWL.—S. Byrom, Philadelphia, Pa.
5,368.—HANGER.—J. Herald, Unadilla, N. Y.
5,369 and 5,370.—MANGERS.—J. L. Jackson, New York city.
5,371.—JAR.—J. Jepson, West Meriden, Conn.
5,372.—CARPETS.—J. H. Smith, Enfield, Conn.
5,373.—LOCK CASE.—B. Steinmetz, Paris, France.
5,374.—JAR.—H. C. Wilcox, West Meriden, Conn.
5,375 and 5,376.—CARPETS.—A. Heald, Philadelphia, Pa.
5,377.—PEN, ETC.—E. S. Johnson, New York city.
5,378.—IRON POST.—M. D. Jones, Boston, Mass.

TRADE MARKS.

545.—MEDICINES.—W. A. Bishop, Dodgeville, Wis.
546.—MUCILAGE.—Carter Brothers & Co., Boston, Mass.
547 to 549.—BRANDY.—Ives, Beecher & Co., New York city.
550.—WHISKY.—C. H. Ross & Co., Baltimore, Md.
551.—GIN.—T. L. Smith, Boston, Mass.
552.—SEWING MACHINE.—The Remington Empire Sewing Machine Co., Ilion, N. Y.

APPLICATIONS FOR EXTENSION OF PATENTS.

HYDRAULIC VALVE.—Helen Woodward, Lowell, Mass., administratrix of Calvin Woodward, deceased, and George W. Woodward, New York city, have petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

HORSE RAKE.—William Horning, New Lebano, Ohio, has petitioned for an extension of the above patent. Day of hearing, February 7, 1872.

STRAW CUTTER.—Thomas H. Willson, Philadelphia, Pa., and Daniel T. Willson, Harrisburgh, Pa., have petitioned for an extension of the above patent. Day of hearing, February 7, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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Inventions Patented in England by Americans.

From October 31 to November 6, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

BATTERY GUN.—R. J. Gatling, Hartford, Conn.
DISINFECTANT.—J. E. Dotch, Washington, D. C.
DISTILLING NAPHTHA, ETC.—C. Pratt, Brooklyn, N. Y.
DOLL.—National Toy Company, New York city.
ENGINE.—T. H. Wagstaff, New York city.
FERRULE, ETC.—T. H. Alexander, R. and F. G. Clarke, New York city.
HAND STAMP.—J. M. Tower, New York city.
ORNAMENTING GLASS.—G. F. Morse, New York city.
PLAISTERS.—B. Brandreth, New York city.
PURIFYING WATER, ETC.—W. C. Selden, Brooklyn, N. Y.
RUFFLER.—A. H. Cramp, Brooklyn, N. Y.
TREATING COTTON SEED.—J. J. Powers, Memphis, Tenn.
TWINE CUTTER.—C. C. Lewis, Gainesville, Ala.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

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In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

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The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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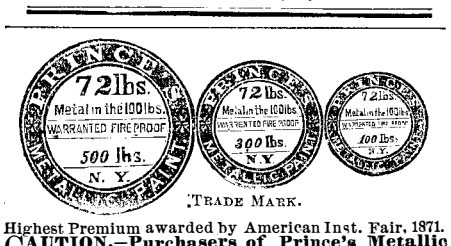

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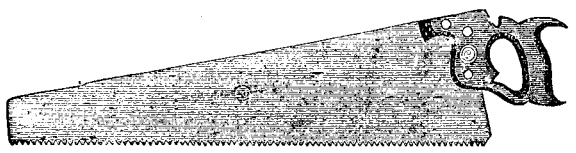

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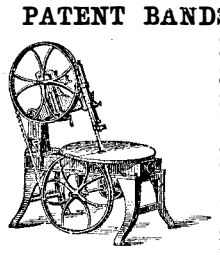

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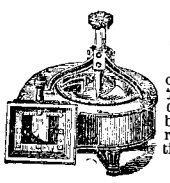

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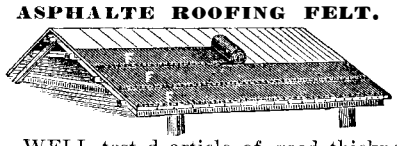

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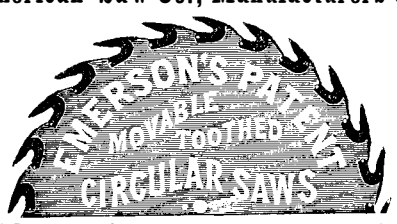

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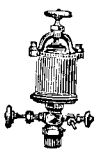

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